FINANCIAL STABILITY REPORT

2008/2009

CNB CZECH
NATIONAL BANK

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Maintaining financial stability is defined as one of the CNB's main objectives in Act No. 6/1993 Coll., on the Czech National Bank, as amended:

Article 2
(2) In accordance with its primary objective, the Czech National Bank shall
.....

d) **supervise the activities of entities operating on the financial market, analyse the evolution of the financial system, see to the sound operation and development of the financial market in the Czech Republic, and contribute to the stability of its financial system as a whole.**

The CNB defines financial stability as a situation where the financial system operates with no serious failures or undesirable impacts on the present and future development of the economy as a whole, while showing a high degree of resilience to shocks.

The CNB's definition is based on the fact that financial stability may be disturbed both by processes inside the financial sector leading to the emergence of weak spots, and by strong shocks, which may arise from the external environment, domestic macroeconomic developments, large debtors and creditors, economic policies or changes in the institutional environment.

The CNB's aim with regard to financial stability is above all to ensure a degree of resilience of the system that minimises the risk of financial instability. To fulfil this aim, the CNB as a monetary and supervisory authority uses the instruments made available to it by the Act on the CNB. Cooperation with other national and international authorities is also very important in this area. In order to maintain financial stability, the CNB focuses on prevention and broad communication with the public regarding the potential risks and factors posing a threat to financial stability. This Financial Stability Report is an integral part of such communication.

LIST OF BOXES

LIST OF ALTERNATIVE SCENARIOS

In 2008, the financial crisis, which started in summer 2007 in the USA and subsequently hit several advanced Western economies, spilled over to other countries and regions. The world economy started heading towards a global recession. Owing to a fall in external demand and a worldwide tightening of the financial conditions, Czech economic growth started to slow sharply in 2008 H2. In 2009 and 2010 the Czech economy is likely to go through a recession. So far during the crisis, however, the Czech financial system has been among the most stable in the EU and is entering the recession in a relatively strong position. Its balance sheets are not burdened by toxic assets and the system is not suffering from a shortage of balance-sheet liquidity. Banks have provided foreign currency loans to businesses to only a limited extent and to households not at all. Thanks to this, the real sector's exposure to foreign exchange risk is very low. The banking sector should thus be able to withstand the second-round effects of the crisis, i.e. the adverse impacts of a decline in the real economy on the ability of corporations and households to repay their previously accepted liabilities.

The main risk scenario for the Czech economy in the coming two years is a situation where the recession in Europe deepens as a result of the crisis and owing to economic policy indecisiveness. This would be reflected in a sharp fall in Czech exports and industrial production. The excess capacity in European industry would moreover lead to a decline in industrial producer prices. A higher corporate insolvency rate would be reflected in growth in risk margins on loans to corporations. Corporations would thus face a substantial tightening of the financial conditions. This could then result in a wave of corporate bankruptcies, leading to rising credit losses in financial institutions. This would be accompanied by growth in unemployment and a fall in households' disposable income. That, in turn, would further reduce households' purchasing power and impair their ability to repay mortgage loans and consumer credit, further increasing the credit losses of banks.

The second key risk is the exceptionally high degree of uncertainty which businesses, financial institutions and households are facing. Economic growth, asset prices, incomes, inflation and the interest rate path have become hard to predict. The level of uncertainty is due primarily to the unstable international environment. Financial systems in some advanced countries are still exposed to stress. As a result, it is impossible to rule out a continuation or escalation of the credit crisis with adverse impacts on the real economy. In this situation of heightened uncertainty, it is vital to the functioning of the economy to ensure sufficient access to liquidity. This will remain a major task for central banks.

Developments in 2008 and 2009 Q1

The world economy cooled significantly during 2008, and the forecasts for 2009 predict an absolute fall in global economic activity. In 2010 this fall should stop and the world economy should start recovering gradually. Continued lack of confidence in financial system stability in some countries and the current low effectiveness of macroeconomic policies are increasing the degree of uncertainty surrounding the timeframe and extent of the global economic recovery. From the point of view of the domestic economy, the unexpectedly strong recession in Germany and the slump in the economies of Central and Eastern Europe (CEE) are bad news. The next two years can thus be regarded as a period of exceptionally strong risks.

In 2008, the world economy switched from rapid growth to global recession with not very bright prospects for a recovery

The decline in external demand was reflected in a fall in domestic industrial production and a rise in the credit risk of the corporate sector

In line with the slowing economic activity observed in the Czech Republic's main trading partners, domestic industrial production started to decline strongly at the end of the year. The decline in external demand hit export-oriented corporations particularly hard. It was confirmed that the size and high degree of the openness of the Czech economy make it highly sensitive to global developments. The financial condition of corporations also started worsening in 2008 H2. Many corporations began to experience problems repaying their liabilities, and for banks the credit risk of the corporate sector started increasing. In response, Czech banks started tightening their lending standards.

The build-up of household debt slowed markedly and household credit risk is increasing

In line with the predictions of the 2007 Financial Stability Report, the rate of growth of household debt in the Czech Republic began to fall markedly in 2008. During 2009, household debt ratios should rise only very modestly or even flatten out. The rapid downturn in economic activity during 2008 has started to be reflected in growth in the household sector's credit risk. The default rate on bank loans to households is gradually increasing, although much more slowly than in the corporate sector. In addition to a considerable worsening of the labour market situation, one possible risk for 2009 is a decline in nominal wages in some employee segments.

Global financial markets were exposed to an extraordinary shock in late 2008

Starting in mid-September 2008 as a result of the collapse of US investment bank Lehman Brothers and the problems in many other financial institutions, international financial markets went through a period of extreme uncertainty regarding the potential failure of counterparties to transactions. This led to a dramatic increase in risk premia, a rise in market volatility and a fall in market liquidity. This was followed by a sharp decline in stock indices. The situation calmed down somewhat in late 2008 thanks to extensive measures implemented by central banks and governments, but credit premia remain relatively high.

The abrupt change in the credit cycle led to drastic changes in central bank policies.

The abrupt change in the credit cycle strongly affected the monetary policies of key central banks. The US Fed lowered its monetary policy rate almost to zero. The ECB and the central banks of some other advanced European economies also cut their monetary policy rates significantly. Some central banks then adopted less conventional measures to exert downward pressure on long-term interest rates.

The situation in global financial markets caused a decline in market liquidity in the Czech Republic …

Owing to the large degree of international integration, the high nervousness on international financial markets spilled over to Czech markets. Activity on the interbank money market dipped and was limited solely to maturities shorter than one week. The liquidity absorbed in 2-week repo tenders declined and the volatility of short-term interest rates increased. Government bond market transactions began to be carried out through brokers instead of market makers, but trading volumes remained unaffected. The stock index fell in line with the declines seen on stock markets abroad. The koruna's exchange rate showed a sharp increase in volatility and depreciated significantly towards the end of last year. In October 2008, there was also a one-off jump in cash in circulation owing to increased demand for cash among corporations and households. However, overall cash holdings have already started returning to their long-term upward trend. This event underlined the need for thorough stress testing of banks, focused on the risk of a liquidity outflow.

In response to the declining demand and falling inflation pressures, the CNB lowered its monetary policy rate cumulatively by 2.25 percentage points between August 2008 and May 2009. The monetary policy easing led to a decline in money market rates, albeit to a lesser extent. The CNB responded to the fall in market liquidity by introducing liquidity-providing repo operations with government bonds as eligible collateral and thus partly calmed the situation in this market.

... and the CNB responded by easing monetary policy and by implementing measures to bolster market liquidity

Despite slowing appreciably, credit growth in the Czech Republic was relatively high in 2008. By the start of 2009, however, newly extended loans were falling year on year, which will be gradually reflected in a decline in total loan growth. Interest rates on loans to non-financial corporations tracked rates on the interbank market and saw a decline especially in 2008 H2. By contrast, rates on household loans were edging up right until the first quarter of this year. Lending standards were also tightened in non-interest components such as required loan collateral, the proportion of own financing and the income required for a particular loan size or instalment amount.

Credit growth gradually fell and the credit conditions tightened slightly

The economic and asset market developments also affected the non-bank financial institutions sector. Mutual funds suffered significant losses due to declining asset prices, leading to a flight to bank deposits. Insurance companies and pension funds were minimally affected by toxic assets, but saw a marked increase in losses due to asset revaluation, a trend that continued into 2009 Q1.

Asset market developments affected the results of insurance companies, pension funds and mutual funds

The heightened uncertainty in international financial markets was reflected in a decrease in investor confidence in the CEE region. This was a response to concerns about the sustainability of some countries' external positions and about the stability of banking systems in which a substantial proportion of loans are denominated in foreign currencies and provided by foreign parent companies. The result was a sharp rise in risk aversion to the CEE region as a whole, manifesting itself in depreciating currencies, rising government debt financing costs and falling stock markets. Although assessing countries based on their geographical position regardless of their economic differences is an artificial analytical construction, countries whose economic characteristics did not show the aforementioned factors were unfortunately also affected by this decline.

In late 2008, confidence in the CEE region declined ...

The use of this artificial analytical construction had an adverse effect on the Czech economy and its currency in late 2008 and early 2009. The year-long phase of rapid appreciation was replaced by a phase of depreciation from September 2008 to February 2009. Even though the resulting depreciation of the koruna may seem strong, the exchange rate essentially returned to its long-term modest appreciation trend. The exchange rate fluctuations negatively affected the financial condition of exporters. In the longer term, however, the weaker koruna should impact positively on firms' profitability.

... manifesting itself in a depreciation of the koruna, although this essentially represents a return to the long-term modest appreciation trend

Different adverse macroeconomic developments stemming from analyses of trends and weak spots abroad, in the domestic economy and in the financial sector were incorporated into alternative scenarios used to test the financial sector's resilience. The alternative scenarios take into consideration the possibility of a further decline in the external and domestic economies, the still tense situation on global financial markets, and property market risks in the Czech Republic. The banking sector's liquidity was also tested.

The future risk scenarios take into consideration the possibility of a further decline in economic activity, the tense situation on financial markets, and the property market situation

Risks to financial stability

Many countries will record a significant slowdown in lending to the private sector or an absolute credit contraction

The global financial market situation remains a significant risk factor. Banks and other financial institutions in the USA and some EU economies suffered considerable losses and were forced to increase their regulatory capital, often with the help of government money. Given the rising credit portfolio losses caused by the recession, this situation can be expected to continue in 2009. Coupled with the limited functioning of other credit market segments, that will lead to a substantial slowdown or an absolute contraction in lending to the private sector in some countries. This factor will have an adverse impact on the world economy and may slow the onset of the economic recovery.

The restoration of confidence in financial institutions is not being aided by some of the steps being taken by authorities at the European level

In countries hit directly by the financial crisis, confidence in the stability of the financial system was not restored to a satisfactory extent despite extensive government interventions and the easing of the financial conditions by central banks. The stabilisation of the situation in the financial systems of some European countries may be delayed by political pressures for an immediate and fundamental Europe-wide change in financial market regulation in an effort to prevent future crises in a situation where the authorities have still not succeeded in eliminating the risks of the current crisis and where the financial markets have not yet fully absorbed its impacts. Similarly risky are the efforts to change the accounting standards so as to optically improve financial institutions' balance sheets instead of taking effective action to clean them up.

Corporations are exposed to high real interest rates

The global increase in credit and liquidity risk in the financial markets adversely affected the functioning of the interest rate transmission channel of monetary policy. Despite the decline in monetary policy rates, there was a rise in the yields demanded on corporate bonds and the nominal interest rates demanded on bank loans provided to risky corporations in most advanced countries. In combination with a substantial slowdown, or an absolute decline in producer prices, corporations using external financing may face a significant tightening of the financial conditions. This factor may foster an increase in corporate bankruptcies and bank credit losses and an escalation of the credit crisis.

The increased aversion to emerging economies and to the CEE region persists

The CEE economies will undergo a tough test in 2009 and 2010. A strengthening of the perceived risks in this region coupled with overly pessimistic expectations regarding its economic situation constitutes a major risk going forward. In more vulnerable countries, difficulties with banking system stability, problems with balance of payments financing and the acceptance of programmes of assistance from supranational institutions cannot be ruled out. If these problems were to cause panic sales of assets in a particular currency, the strong depreciation pressures could spill over to other currencies.

Czech corporations have so far maintained access to bank loans, but the situation may worsen

Thanks to the fact that Czech corporations have relatively low debt ratios by international comparison, the slowdown in growth in corporate loans has so far been more moderate than in most EU countries. However, a continuing decline in Western European economies with a considerable knock-on effect on external demand for Czech firms' products may change this situation. A significant rise in the number of insolvencies in the corporate sector and growth in credit losses in the banking sector would greatly reduce creditors' willingness to lend to non-financial corporations.

The considerable slowdown in economic growth will lead to a significant increase in the public finance deficit in the years ahead. The CNB estimates that the ratio of public debt to GDP may rise as high as 39% at the end of 2010. Of course, this will be accompanied by increased issuance of government bonds on financial markets. In this situation, the Czech Republic, like many other relatively small economies, is exposed to the risk of rising interest rates on government debt. Massive government demand for savings might increase private entities' debt financing costs as well. Monetary policy would have limited options for offsetting the tightened financial conditions.

Growth in government debt might increase the price of money for private entities as well

The domestic property market trends identified as risky in the 2007 Financial Stability Report continued into 2008. All types of residential property continued to show rapidly rising prices. At the end of 2008, the ratios of apartment prices to average wages were close to their historical highs in most regions. The possibility of apartment prices being overvalued in relation to households' ability to repay house purchase loans from their incomes is thus a significant risk going forward. Signs of an absolute decrease in residential property prices appeared at the end of 2009 Q1, and a more substantial decline cannot be ruled out.

A more substantial decline in residential property prices cannot be ruled out

House purchase loans in the Czech Republic have so far been a less risky component of loans to households. The loan-to-value (LTV) ratio for the total stock of house purchase loans remained very favourable at the end of 2008. However, over the last three years new mortgage loans with LTV ratios of around 80%–90% have routinely been provided. These loans may thus become problematic in the event of default and a parallel decline in property prices.

Mortgage loans extended over the last three years seem riskier

The Czech commercial property market saw a combination of record-high planned supply and a decline in realised demand. This was reflected in a fall in prices and a rise in the vacancy rate. In mid-2008, the logistics and industrial property market saw a virtual halt in new construction. Developers have so far mostly responded to the decline in demand by either temporarily suspending or completing stopping project implementation. However, the deferred implementation of projects increases the default risk. This risk is being reinforced by tighter bank lending conditions.

The commercial property segment is in a difficult situation

With regard to the risks identified, the resilience of the domestic financial system was assessed by means of stress tests on banks, insurance companies and pension funds using three alternative adverse scenarios entitled "Europe in recession", "market nervousness" and "economic depression". A stress test was also performed on banks' balance-sheet liquidity. The first scenario is considered by the CNB to be the most probable. In the other two scenarios, the intensity of the fall in economic activity is amplified. The "market nervousness" scenario is also used to test the impact of pressures for a rapid depreciation of the exchange rate due to regional contagion.

The domestic financial system was exposed to both expected and highly unlikely shocks in stress tests

Assessment of the financial sector's resilience

According to the stress tests the Czech banking sector still seems resilient to a wide range of risks

According to the stress tests, the Czech banking sector is resilient to the market, credit and some other risks undertaken despite the highly pessimistic settings of the worst alternative scenario. However, if the economy developed in line with the alternative scenarios, some banks would suffer losses which might require capital injections from shareholders. The CNB and the Ministry of Finance have prepared a preventive amendment to the Act on Banks which simplifies the process of increasing a bank's capital and enables the central bank to respond more flexibly to banks' problems using some new instruments.

Insurance companies and pension funds are particularly sensitive to a larger increase in long-term interest rates

The stress tests indicate good resilience of insurance companies and pension funds to a downturn in economic activity in all the scenarios. However, any further growth in long-term yields and thus a fall in bond prices would have adverse effects. Such a development would generate a need for a larger capital increase by shareholders, particularly in the pension fund sector. The decline in economic activity in 2009 will be reflected to some extent in the insurance sector, primarily in a fall in demand for insurance and thus lower growth in premiums written in both the life and non-life insurance segments.

The domestic financial system showed the least resilience in the "market nervousness" scenario, which causes a fall in GDP and a rise in interest rates

The biggest stress to the Czech financial system was the "market nervousness" scenario, which would necessitate capital injections into the financial system of around CZK 23 billion (0.6% of GDP). Underlying this impact is a combination of significant losses due to the credit risk of banks and losses from a decline in bond and stock prices in other financial institutions. The other scenarios have smaller impacts – the "Europe in recession" scenario would require new capital of CZK 14 billion and the "economic depression" scenario new capital of CZK 22 billion – since the shocks in these scenarios lead to a fall in interest rates and thus to a rise in prices of bonds, which reduces the other losses.

The stress tests of banking sector liquidity also indicate a relatively high level of resilience

One of the risks that might arise if the highly adverse scenarios materialise is heightened nervousness on domestic financial markets. This might happen particularly if some banks fall below the regulatory threshold for the capital adequacy ratio. The panic would then be reflected in bank runs and in problems in asset markets. However, the stress test of balance-sheet liquidity indicates a relatively high resilience of the banking sector to market and balance-sheet liquidity risk. Although the simulations of strong shocks cover all liquid components of banks' balance sheets simultaneously, and despite the fact that the assumptions of the tests are severe, no bank gets into a situation where it would be unable to repay its obligations by restructuring or liquidating part of its portfolio.

Factors contributing to the Czech financial system's resilience

The Czech financial system entered the recession in a good starting situation. Most institutions maintained solid profits in 2008. The Czech banking sector's strong position is supported by high profitability, good balance-sheet liquidity, a high deposit-to-loan ratio and a very low proportion of foreign currency loans. The Czech banking sector is the only one in Central and Eastern Europe with a positive net external position and is thus independent of external funding.

The starting position of the financial system, and particularly of the banking sector, is very good

The Czech banking sector is sufficiently capitalised. In March 2009, its capital adequacy ratio was 12.9% and its Tier 1 capital adequacy was only slightly lower. By international comparison, the sector has a very good capital ratio, i.e. a relatively high ratio of capital to non-risk-weighted assets. The Czech Republic has not been forced to adopt measures to bolster the solvency of the banking sector and has merely increased the deposit insurance limit in response to developments in other European countries.

The banking sector entered 2009 sufficiently capitalised

The external position of the Czech economy is strong and the chances of it being exposed to sharp depreciation pressures due to problems in other economies in the region are thus relatively small. This risk is further decreased by investors' growing ability to differentiate between individual economies in the region. The Czech Republic, Slovakia and Poland are now, together with Slovenia, viewed as the most stable economies in the entire region. The robustness of the external position is evidenced, among other things, by a large output surplus for 2008 and an expected improvement in the current account this year and the next. The domestic economy's external financing need should moreover be covered safely by current funds without the need to use foreign exchange reserves.

The external position of the Czech economy is strong, increasing its resilience to contagion risks linked with developments in the CEE region

CNB monetary policy should continue to foster stabilisation. The CNB's macroeconomic forecast dating from the beginning of May 2008 predicts a significant fall in inflation. Accordingly, monetary policy rates and domestic short-term money market rates should remain at low levels over the next two years. This will act as a significant anti-cyclical factor.

CNB monetary policy should remain accommodative, which will have stabilising effects

PART I

The Czech National Bank is pleased to present its fifth Financial Stability Report to the public. This report analyses the risks to the financial stability of the Czech Republic in the near future on the basis of previous and expected developments in the real and financial sectors.

This year's Report profits from a modelling and analytical framework for the financial stability area based on advanced stress testing, liquidity testing and accompanying economic models. This year, this framework, which is constantly being refined, has been expanded to include a comprehensive test of banks' balance-sheet liquidity. The bank stress testing methodology has also undergone quite a major revision, including the creation of a pilot methodology for capturing the impacts of individual shocks over time. Three alternative adverse scenarios were constructed on the basis of an analysis of trends and weak spots in the domestic and external economy and financial sector, and their impact on the financial sector was tested. The alternative scenarios, drawn up with the aid of the CNB's macroeconomic model, take into account the current situation on global financial markets, developments in the Czech property market and the risks of a decline in the external and domestic economies. The alternative scenarios – entitled "Europe in recession", "market nervousness" and "economic depression" – are presented in the Report one by one in the form of boxes in the sections that analyse the main features of each scenario. Section 4.2 *Assessment of the financial sector's resilience* discusses the impacts of all the scenarios. The stress tests of banks, insurance companies and pension funds are complemented by several quantitative indicators of financial system stability, such as a banking sector stability indicator, a non-financial corporation creditworthiness indicator and a newly constructed financial stability map.

The structure of the Report follows the logic of the approach to the analyses, i.e. the risks in each sector are first identified and the size of stress that the financial sector is able to withstand is then examined. The section entitled *The real economy* discusses developments in the external and domestic macroeconomic environment and in key domestic sectors, i.e. households and corporations. The section entitled *Asset markets and the financial infrastructure* analyses developments and risks in the financial market, the property market and the financial infrastructure. The last section of the main part of the Report, *The financial sector*, covers developments in the financial sector and includes a section assessing the Czech financial system's resilience to shocks under the three alternative scenarios. The Report ends with a table of key indicators relevant to financial stability and an annex analysing the situation of overindebted households.

The Report includes four thematic articles. The article *Instruments for Curbing Fluctuations in Lending over the Business Cycle* discusses instruments for reducing procyclical bank lending behaviour and reveals that Czech banks are among those that provision in a procyclical manner. The article *Property Price Determinants in the Czech Regions* discusses factors affecting property prices and, among other things, identifies overvalued property prices in 2002/2003 and 2007/2008. The Article *Models of Bank Financing of Czech Corporations and Credit Risk* shows that the level of credit risk at bank level decreases significantly in line with the extent to which firms applying single relationship banking occur in the bank's portfolio. The last article *Estimating Expected Loss Given Default* discusses the estimation of a key credit risk parameter – loss given default (LGD) – and reveals that the average LGD of the sample of firms analysed varies over time from 20% to 50%.

In the current situation, where the economic and financial outlook is changing dynamically, it is very important for the Report to be up-to-date and forward-looking. For this reason, the Report has been re-named the 2008/2009 Financial Stability Report. The new name reflects the fact that because some important full-year data do not become available until March of the following year, the Financial Stability Report is published practically in the middle of the year, and so its data coverage in some other areas can be extended to January–May of the current year.

This Financial Stability Report was approved by the Bank Board of the Czech National Bank on 14 May 2009 and published on 16 June 2009. It is available in electronic form at *http://www.cnb.cz/.*

Economic growth in the advanced economies
(year-on-year growth in %; outturns and October 2008 and April 2009 forecasts)
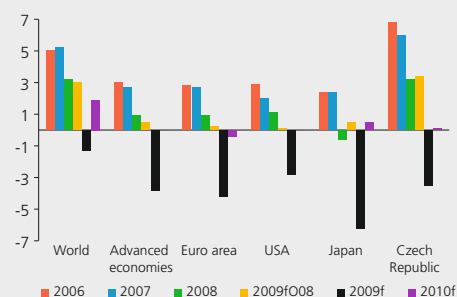
Source: IMF (World Economic Outlook, April 2009)
Note: 2009fO08 is the October 2008 forecast for 2009 and 2009f is the April 2009 forecast for 2009.

Economic growth in emerging and developing countries
(year-on-year growth in %; outturns and October 2008 and April 2009 forecasts)
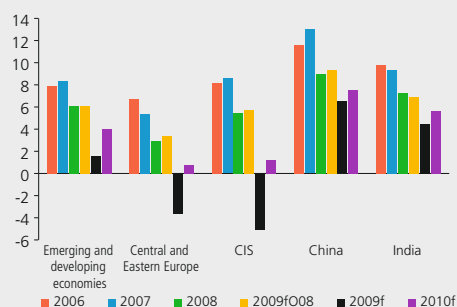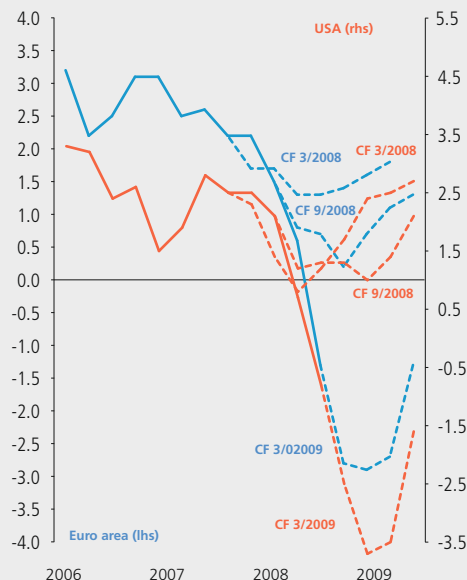

Source: IMF (World Economic Outlook, April 2009)
Note: 2009fO08 is the October 2008 forecast for 2009 and 2009f is the April 2009 forecast for 2009.

Expected and actual economic growth in the USA and the euro area
(quarterly data; year-on-year growth; outturns versus expectations of Consensus Forecasts, CF)

Source: Eurostat, US Bureau of Economic Statistics, Consensus Forecasts

2 THE REAL ECONOMY

2.1 THE MACROECONOMIC ENVIRONMENT

The external macroeconomic environment was significantly affected in 2008 and in the first few months of 2009 by the direct and indirect effects of the financial crisis. Owing to a strong decline in demand, the world economy started to slip gradually into recession. Underlying these developments were rapid fluctuations in asset prices, interest rates and exchange rates. In the countries hit directly by the financial crisis, i.e. in the USA and Europe in particular, confidence in the stability of the financial system was not satisfactorily restored despite extensive government interventions and an easing of the financial conditions by central banks. For the same reason, the announced fiscal programmes were not yet able to stop the fall in consumer and investment demand. The gradual downward revisions to the 2009 and 2010 forecasts for economic activity continued into 2009 Q1 this year, and there was a high level of uncertainty surrounding the time frame of the end of the recession and the extent of the subsequent recovery. The next few years can be regarded as a period of exceptionally strong risks. However, a continuation and escalation of the financial crisis and a recession in the Western economies remain the main risks.

The Czech economy was not hit directly by the financial crisis in 2008. However, indirect effects of the crisis started to be observed in 2008 H2. The current outlook for the Czech economy for the next two years is fairly negative. A fall in GDP in 2009 should be replaced by only a weak recovery in 2010. One major side effect of the developments in the world economy was sharp volatility in the koruna exchange rate, which, after appreciating strongly in 2007 H2, started to depreciate significantly in 2008 H2. Although the exchange rate fluctuations can be expected to have some adverse impact on exporters, the return of the exchange rate to weaker values more in line with fundamentals should have a positive effect on the economy in the longer run.

The world economy cooled significantly during 2008. In 2007, according to IMF methodology, it grew by more than 5%, but in 2008 the growth was down to just 3.2%. In its new April 2009 forecast, the IMF expects a decline in world economic activity of 1.3% in 2009, which can be regarded as a global recession (see Chart II.1). The forecast predicts that the advanced economies will find themselves in recession in 2009 (see Chart II.1), while the emerging economies[1] as a whole will maintain positive growth (see Chart II.2). Both these charts show two forecasts for 2009 (from October 2008 and April 2009). The differences between them show just how dramatically the outlook for this year has been revised in recent months. From the point of view of the Czech economy, the unexpectedly strong recession in Germany (the IMF forecasts a decline in GDP of 5.6%) and the fall in the economies of Central and Eastern Europe (CEE) are bad news. The forecast also expects only a very modest recovery during 2010. However, this recovery will be due chiefly to the emerging economies.

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[1] The April IMF forecast and Consensus Forecasts (a publication containing the average estimates of a broad representative sample of analysts and forecasters) expect first a decline in the world economy and then a gradual recovery in the next two years. The IMF's April forecast, published in the World Economic Outlook (in which the Czech Republic was ranked among the advanced countries for the first time), and Consensus Forecasts were predicting the aforementioned trend in economic activity for the Czech Republic as well.

Chart II.3 confirms that the economic growth forecasts for the advanced economies were substantially revised between September 2008 and April 2009. The magnitude of the revisions indicates that the effect of the financial crisis on the real economy was underestimated by analysts and forecasters last year. Chart II.4 shows that the uncertainty regarding future economic growth has been rising since the start of 2008, making growth very hard to predict. In this environment, businesses – including financial institutions – are faced with an exceptionally high level of uncertainty. The unusual size of the current recession is also evidenced by the rates of growth of industrial production and exports in industrial economies, with the advanced economies of this type in Asia being hardest hit. At the end of 2008, exports in many countries were down by as much as a third year on year (see Chart II.5) and industrial production in some countries recorded declines of a similar extent (see Chart II.6). The charts also show that the economic downturn is much stronger than the previous recession of 2001–2002. Rapid falls in commodity prices also testify to the strength of the economic slowdown (see section 3.1).

The financial crisis and the slump in economic activity have fundamentally changed the nature of central bank monetary policy (see Chart II.7). The US Fed lowered its monetary policy rate to almost zero and the Bank of England did likewise. These central banks adopted a series of measures to boost commercial banks' holdings of reserves on accounts at the central bank and to exert downward pressure on long-term interest rates. This type of policy, known as "quantitative monetary easing" has been practised by the Bank of Japan for many years. The ECB also drastically cut its monetary policy rates and took accompanying measures to provide liquidity to the financial system. However, the decline in short-term money market interest rates did not pass through symmetrically to long-term interest rates and rates on loans provided to the private sector. The monetary conditions thus were eased to a limited extent (see section 3.1).

In response to the declining demand and falling inflation pressures, the CNB also repeatedly lowered its monetary policy rate. The monetary policy easing led to a decline in money market rates, albeit to a lesser extent (see section 3.1). The phase of declining rates was interrupted by depreciation pressures on the koruna linked with falling confidence in the entire CEE region in February 2009. This resulted in revised expectations regarding the scope for lowering monetary policy rates. The CNB did not cut its monetary policy rates again until May 2009.

The assets of key central banks rose significantly as a result of the actions taken by these central banks to support banking system liquidity (see Chart II.8). This raises concerns of a future surge in inflation in the relevant economies based on the assumption that the growth in central banks' assets will be accompanied by money supply growth. From the short-term point of view, the concerns about rising inflation are not justified because of the current negative output gap. From the long-term point of view, the concerns regarding the inflationary effect of the central bank measures may also be exaggerated, since they will not necessarily lead to increased money supply growth. The purchases of government and private assets by central banks and the increased liquidity provision are being reflected primarily in a rise in commercial bank assets held at central banks, i.e. in increased holdings of free reserves of commercial banks. The current situation in banking systems, however, is creating strong barriers to the pass-through of this policy to higher rates of growth of loans. Many large international banks have suffered

CHART II.4
Uncertainty regarding expected GDP growth in selected economies
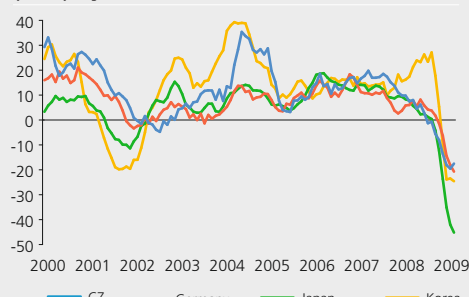(mean standard deviation of GDP growth estimates for given and next year from Consensus Forecasts; in percentage points)
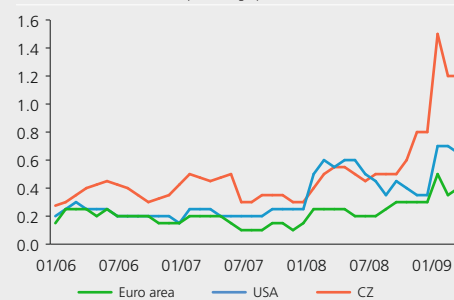
Source: Consensus Forecasts, CNB calculation

CHART II.5
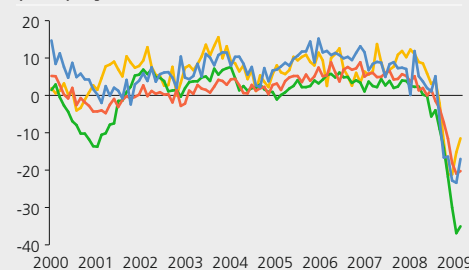**Export growth in industrial economies**
(year-on-year growth in %)

Source: Thomson Datastream

CHART II.6
Industrial production growth in industrial economies
(year-on-year growth in %)

Source: Thomson Datastream

CHART II.7

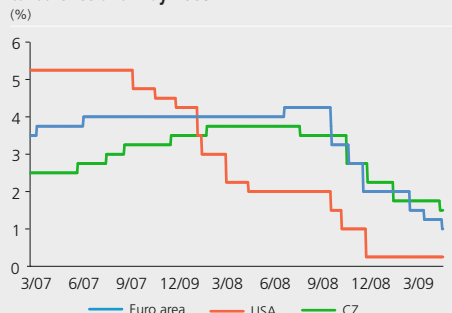**Monetary policy rates between the start of the financial turbulence and May 2009**

(%)

Source: Thomson Datastream

CHART II.8

Balance sheet indices of the Fed, Eurosystem and Bank of England

(October 2008 = 100)

Source: Thomson Datastream
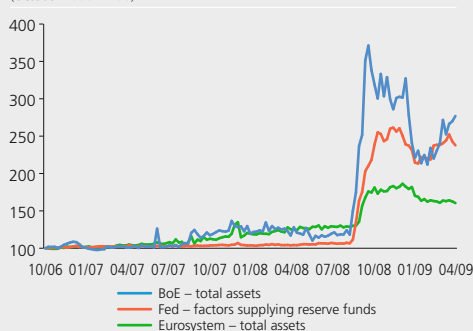
CHART II.9

Real interest rates on corporate debt

(%)
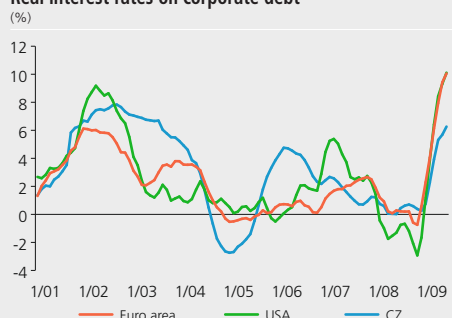
Source: Merrill Lynch Corporate Indices, Thomson Datastream
Note: Corporate bond yields in the euro area and the USA and interest rates on long-term corporate loans in the Czech Republic adjusted for current producer price inflation.

enormous losses, and this is putting pressure on regulatory capital. The newly paid capital of banks in the EU (USD 300 billion at the end of 2009 Q1, of which around USD 180 billion has been supplied by governments) exceeds the losses they have so far posted during the crisis (USD 260 billion). However, it is reasonable to expect that the losses in the coming quarters will necessitate further capital injections or exert pressure for a reduction in banking assets. In this situation, central bank measures to increase the monetary base would not necessarily lead to money supply growth, but might only cause a decline in the money multiplier.

The potential impacts of the financial crisis on banks' capital and indirectly on their ability to lend are revealed by the still rising estimates of financial institutions' total losses on loans and related assets. The need to recapitalise and restructure banks, combined with the limited functioning of other credit market segments, is causing at the very least a rapid slowdown in growth in lending to the private sector, and in some countries even a credit contraction (see section 4.1). A decline in political support for fiscally costly measures poses a risk to banking sector stabilisation in the USA and other countries. The stabilisation of the situation in the financial systems of some European countries is being jeopardised by political pressures for an immediate and fundamental Europe-wide change in financial market regulation in an effort to prevent future crises in a situation where the authorities have still not succeeded in eliminating the risks of the current crisis. Similarly risky are the efforts to change the accounting standards so as to optically improve financial institutions' balance sheets instead of taking effective action to clean them up.

Besides the obstacles on the credit supply side, demand for loans among households and corporations is falling sharply. This is due in part to the real interest rate level (see Chart II.9), which may be proving too high particularly for the corporate sector in relation to its investment returns. The first reason is that despite the fall in monetary policy and short-term market interest rates, corporate bond and long-term loan interest rates have not dropped below their pre-crisis levels in many countries. In contrast, the increase in credit risk has led to a rise in corporate bond yields in the euro area and the USA (see Chart II.9).[2] This factor testifies to reduced monetary policy effectiveness, or impaired monetary policy transmission, at a time of financial stress (see section 3.1). The second reason is declining prices at which corporations sell their output. These two factors together are increasing real debt servicing costs. As a result, the corporations using external financing may be facing a significant tightening of the financial conditions.[3] Households in many countries may be in a similar situation. This increases the risk that large numbers of economic agents will not be able to repay loans taken out in previous years. This factor may be a significant contributor to slower emergence of the world economy from the recession and a more distant recovery. A rise in the private sector saving rate, however desirable it may be from the long-term point of view, will then foster a slower and weaker recovery in Western economies (see section 3.1).

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2   Corporate loans interest rates in the Czech Republic, in contrast to the euro area and the USA, have so far followed the decline in short-term market rates to some extent (see section 4.1). Nevertheless, owing to growth in industrial producer prices, real rates have been increasing here as well.

3   The tightening of the credit conditions ensues to a certain extent from the zero lower limit for monetary policy rates. In its 27 April 2009 issue, the Financial Times reported that the Fed analyses presented at the April monetary policy meeting stated that if the monetary policy rate was set according to the Taylor rule (a rate recommendation tool based on the difference between target and forecast inflation and the output gap), it would have to fall to -5%.

Overall, therefore, one can identify many reasons why the cyclical decline in Western economies might be deeper and longer than currently forecasted. The stress potential of the change in corporate and household nominal income growth is indicated by a comparison of nominal GDP growth in previous years in selected economies with the 2009 forecast (see Chart II.10). In terms of expected nominal income growth, economic agents are in an environment which not only is hard to predict, but also has very different features than the previous decade. The very low inflation will on the one hand mitigate the fall in the rate of growth of real income and thereby prevent a decline in demand. Debt deflation, on the other hand, would have a significant adverse effect on debtors, especially if it were protracted. The same goes for governments, which will substantially increase their indebtedness as a result of the financial crisis and economic decline. Nevertheless, we consider concerns that the resulting increase in the debt financing need will lead to a global rise in world real interest rates to be premature (see section 3.1).

The macroeconomic situation in the economies of the Central European region (the Czech Republic, Slovakia, Poland and Hungary) remained relatively successful in 2008, with the exception of Hungary (see Table II.1). The Czech Republic, Slovakia and Poland are now, together with Slovenia, viewed as the most stable economies in the entire CEE region. Nevertheless, they too were hit by the fall in confidence related to concerns about the sustainability of some countries' external positions and about the stability of banking systems in which a substantial proportion of loans are denominated in foreign currencies and provided by foreign parent companies. These concerns manifested themselves chiefly in depreciating currencies, rising government debt financing costs (see section 3.1) and falling stock markets. The national authorities responded to the negative and often incorrect information about the situation in the region with active communication aimed at explaining that the situation differs from country to country and that some of the negative information is moreover based on misinterpreted statistics (see section 4.1). Thanks to this communication, international investors and supranational institutions started gradually differentiating between the individual countries of the region. The different economic situations of these countries are confirmed by their ratings (see Chart II.11). Last year, Fitch Ratings upgraded the Czech Republic's rating to A+. This means the Czech Republic, together with Slovakia, has the highest rating in the region.

However, the CEE economies will undergo a tough test in the next two years. Even those whose situation can be regarded as stable will face flat or falling economic activity and rising public finance deficits. In the more vulnerable countries of the region, difficulties with banking system stability, problems with balance of payments financing and the acceptance of assistance programmes from supranational institutions cannot be ruled out. These factors could trigger further waves of depreciation pressure on the currencies of countries with floating exchange rates or devaluation pressure on countries with hard pegs. Countries with floating exchange rates seem to be in a better position, since a slight depreciation of their currencies should foster a faster recovery of their economies. However, panic sales of regional assets, which could lead to excessive and fundamentally unjustified currency depreciations, pose a risk. The chances that the Czech economy will be exposed to these potential pressures are relatively low thanks to its stronger external position (see Box 1). Investors' growing ability to differentiate between the individual economies in the region also reduces this risk.

For the Czech economy in the last few years, sharp fluctuations in the koruna's

CHART II.10
Nominal GDP and its forecast
(year-on-year growth in %)
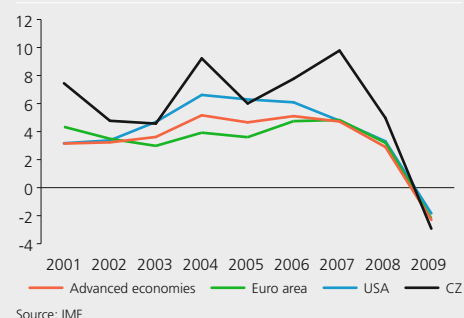
Source: IMF

TABLE II.1
Macroeconomic indicators for Central European economies
(2009 and 2010 – EC forecasts)

Indicator	Country	2007	2008	2009	2010
Real GDP growth (%)	CZ	6.0	3.2	-2.7	0.3
	SK	10.4	6.4	-2.6	0.7
	HU	1.1	0.5	-6.3	-0.3
	PL	6.6	4.8	-1.4	0.8
Inflation – HICP (%)	CZ	3.0	6.3	1.1	1.6
	SK	1.9	3.9	2.0	2.4
	HU	7.9	6.0	4.4	4.1
	PL	2.6	4.2	2.6	1.9
Government debt (% of GDP)	CZ	28.9	29.8	33.7	37.9
	SK	29.4	27.6	32.2	36.3
	HU	65.8	73.0	80.8	82.3
	PL	44.9	47.1	53.6	59.7
Government balance (% of GDP)	CZ	-0.6	-1.5	-4.3	-4.9
	SK	-1.9	-2.2	-4.7	-5.4
	HU	-4.9	-3.4	-3.4	-3.9
	PL	-1.9	-3.9	-6.6	-7.3
Current account balance (% of GDP)	CZ	-1.5	-3.1	-3.2	-3.3
	SK	-5.1	-6.8	-7.5	-7.1
	HU	-6.2	-8.4	-5.0	-4.8
	PL	-5.1	-5.3	-4.7	-3.7

Source: EC (Economic Forecast, Spring 2009)

CHART II.11
Sovereign ratings of selected countries
(long-term ratings in foreign currency, Fitch)
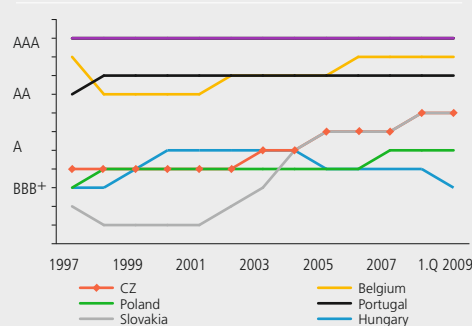
Source: Fitch

The koruna exchange rate and its volatility

| | CZK/EUR (left-hand scale) | Implied 1M volatility (right-hand scale) |
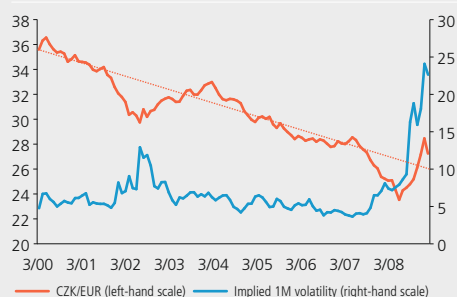
Source: CNB calculation based on CNB data
Note: The dotted line shows the long-term trend.

CHART II.13
The balance of payments
(% of GDP)

Output — Current account
Direct investment — Financial account
Income
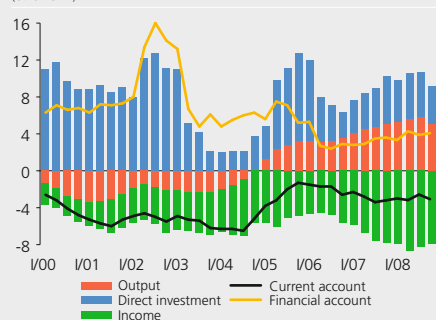
Source: CZSO, CNB
Note: Annual sliding totals of balance of payments components and nominal GDP.

CHART II.14
The investment position of the Czech Republic
(CZK billions)

Position — Position net of FDI
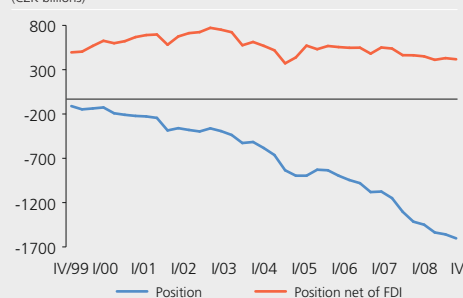
Source: CNB

exchange rate have been a major side effect of developments in the world economy and specifically in the CEE region. Between summer 2007, when the financial market turbulence started abroad, and summer 2008, the koruna appreciated strongly in nominal terms. However, in the second phase of the financial crisis, which started with the failure of US investment bank Lehman Brothers, the lack of confidence spilled over to the emerging economies and their currencies started to weaken. Exchange rate volatility increased considerably at the same time (see Chart II.12). These pressures increased in intensity in February 2009, owing among other things to incorrect information on some features of the domestic economy published in major foreign periodicals.[4] Successful communication by the CNB with the financial markets led relatively quickly to stabilisation of the koruna at levels that can be regarded as consistent with the fundamentals of the Czech economy. Although the sharp exchange rate fluctuations and increased volatility can be expected to have an adverse effect on exporters (see section 2.2), the depreciation of the exchange rate should have a positive effect on economic activity and firms' profitability in the longer run. Chart II.12 also illustrates the important fact that even though the depreciation of the koruna in 2008 H2 may seem strong, the exchange rate to a large extent returned to its long-term modest appreciation trend.

The Czech Republic's external balance (see Chart II.13) continued to record positive trends. As in 2008, the current account deficit was roughly 3% of GDP. The robustness of the external position is evidenced by the goods and services balance surplus, which – despite decreasing at the close of the year – stood at 5% of GDP and covered practically the entire income deficit net of reinvested earnings. The direct investment surplus was 4% of GDP, although two-thirds of this was due directly to reinvested earnings. Chart II.14 shows that the Czech Republic's deepening investment position deficit is linked exclusively with net FDI inflow. Net of this deficit, the balance remains at the positive levels usually seen in previous years. The Czech Republic's external balance should further improve in the next two years (see Box 1).

Box 1: The Czech Republic's external debt and its sustainability

In response to the increased perceived risk of the situation in the CEE region, investors and analysts started to address the issue of the external sustainability of these economies. As some of these economies maintain fixed exchange rates and in many of them firms the government sector and households have significant foreign currency debts, the analyses focus mainly on the future balance of foreign exchange funds for financing the current account deficit and for covering external debt service payments and any external financing needs. This type of analysis is motivated by the experience from the Asian crisis in the second half of the 1990s, when rapid currency depreciations had a harsh impact on economic agents whose balance sheet assets and liabilities were not balanced in currency terms.

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4   The Financial Times incorrectly reported the size of the banking sector's external debt, and the Economist mistakenly stated that Czech households were in difficulties due to foreign currency loans. The CNB responded to this misleading information by issuing a press release (see http://www.cnb.cz/en/public/media_service/press_releases_cnb/2009/090224_statement_FT.html) and sending letters to the editors of both periodicals. These letters were subsequently published.

One measure of external sustainability is the financing gap, which compares the annual need for foreign exchange with the inflow of foreign direct investment, the range of permissible reductions in the country's foreign exchange reserves and with other available market sources of financing of foreign exchange needs. Financing gap estimates are dependent on numerous assumptions regarding inflows and outflows of external funds in the economy and on the specification of the critical level of forex reserves. A typical example of external sustainability analysis is the IMF's Debt Sustainability Framework, in which the gross external financing need is calculated as the sum of the current account deficit, repayments of long-term external debt principal and existing short-term external debt. Although this approach is better suited to assessing debt sustainability in developing countries with fixed exchange rates, it is routinely applied to advanced countries as well. According to the IMF, the Czech Republic will need around USD 40 billion per year to cover its external financing needs this year and the next.[5]

The CNB's estimates regarding the external financing need, based on the balance of payments forecast for this year and the next (see Table II.1 Box), suggest that the IMF's aforementioned estimates of around USD 40 billion per year are exaggerated. As regards the current account deficit, it creates virtually no external financing need in the coming years. The CNB's latest forecast (May 2009) predicts certain current account deficits, but these include reinvested earnings, which by their very nature are self-financing. Including reinvested earnings, the external financing need arising from the current account should in fact be negative. Given the decline in economic activity, it cannot be ruled out that foreign-owned firms' profits will be lower and hence reinvested earnings will also be lower. In such case, however, the outflow of funds via the income balance, which is part of the current account, will also be lower. Taking into consideration the short-term external debt and projected debt service, the financing need will be just above USD 30 billion per year.

If, moreover, we start working with the specifics of the Czech economy, we can easily conclude that the calculation method above says little about the external financing risks for a Czech-type economy. As regards short-term external debt, for example, the method does not take into account the fact that domestic entities have short-term assets at their disposal which could be used to finance the liabilities at least partly. The short-term external debt is linked to a large extent with the business activities of firms and can thus be refinanced relatively easy. Chart II.1 (Box) shows that even at present the banking sector has assets equivalent to roughly 80% of the total gross foreign debt.[6]

TABLE II.1 (BOX)
Financing of the external position of the Czech economy

CZK billions	2009	2010
Financing of current account	*-10*	*-35*
- current account (deficit)	75	60
- reinvested earnings	-85	-95
Amortisation of external debt	135	135
- debt service	*174*	*170*
- interest paid	-39	-35
Short-term debt as of 31 December 2008	499	499
Financing need in CZK billions	**624**	**599**
Financing need in USD billions	**31**	**30**
FX reserves (as of 31 December 2008)	716	716
FX reserves/financing need (in %)	**115 %**	**120 %**

Source: CNB
Note: Current account and reinvested earnings – CNB May 2009 forecast.
Data on debt amortisation – CNB estimate based on an analysis of the Czech Republic's investment position.
The financing need is made up of the items in italics (interest paid is already included in the current account).

CHART II.1 (BOX)
Ratio of the gross external debt of the Czech Republic to GDP and its coverage by the external assets of the banking sector (CNB and commercial banks)
(%)
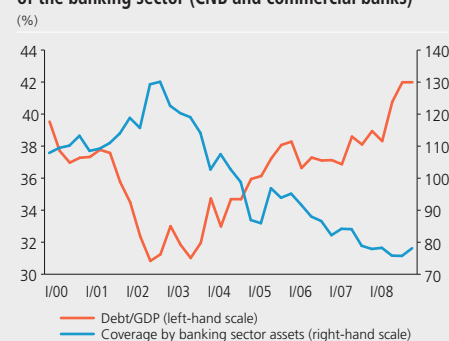
Debt/GDP (left-hand scale)
Coverage by banking sector assets (right-hand scale)
Source: CNB

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5   See the IMF Staff Report for the 2008 Article IV Consultation with the Czech Republic, p. 27, http://www.imf.org/external/pubs/ft/scr/2009/cr09122.pdf
6   Banks and corporations have sufficient assets at the aggregate level to finance their external debt, even if that is not necessarily the case at the individual level.

CHART II.15

Actual and projected economic growth in the Czech Republic

(%; CNB May forecast)

■ 90% ■ 70% ■ 50% ■ 30% confidence interval

Source: CNB

CHART II.16

Actual and projected inflation in the Czech Republic

(%; CNB May forecast)

■ 90% ■ 70% ■ 50% ■ 30% confidence interval
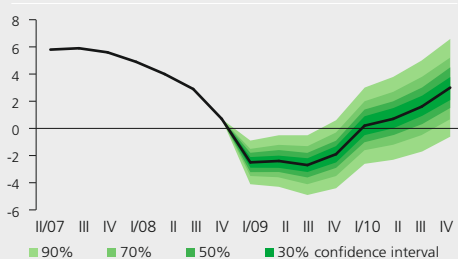
Source: CNB

To sum up, we can say that the external financing need does not far exceed the current short-term debt, which can be financed to a large extent from short-term external assets without any need to use foreign exchange reserves. Even in the absence of FDI inflows, the remainder of the financing need would be covered by the existing forex reserves. The Czech Republic is thus not exposed to the risk of a financing gap and its current external sustainability position can be regarded as very stable.

In 2008 H1 the domestic economy recorded relatively dynamic – albeit gradually decreasing – growth, whereas in H2 it showed a marked slowdown. The CNB's May 2009 macroeconomic forecast assumes that GDP will fall by a total of 2.4% in 2009 owing to low external demand, further impacts of the global economic and financial crisis, a fall in investment and slackening household consumption (see Chart II.15). The recovery is expected to start in 2010, but this date is associated to a large extent with uncertainty regarding external demand growth. CPI inflati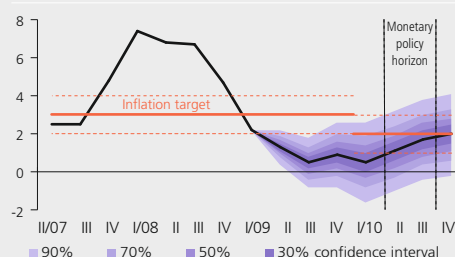on dropped from levels between 6% and 7% in 2008 Q1–Q3 to about 2% in 2009 Q1. According to the CNB's May forecast, headline inflation will fall quickly below the inflation target in the course of 2009. In 2010 it will rise again and reach the 2% inflation target at the year-end (see Chart II.16). Consistent with the forecast is a decline in 3M PRIBOR market interest rates this year and a modest rise in 2010.

The gloomier picture of economic activity painted in the CNB's May macroeconomic forecast formed the basis for the first of the three alternative scenarios used in section 4 to test the resilience of the Czech financial sector. This scenario is called "Europe in recession".

Alternative scenario A: "Europe in recession"

Scenario A, which is based on the CNB's May 2009 macroeconomic forecast, assumes a relatively marked fall in domestic economic activity, due mainly to a strong recession in the euro area. Annual GDP growth would fluctuate around -2.5% on average in the individual quarters of 2009 then switch in 2010 Q1 to slightly positive figures, which would gradually increase. The exchange rate would gradually appreciate during 2009 and then stabilise at levels around CZK 26/EUR. Interest rates would remain relatively low given the low inflation pressures. The fall in domestic economic activity would result in rising default rates in the non-financial corporation and household sectors. Overall credit growth would slow to relatively low levels, and share and property prices would show further – albeit comparatively modest – declines. We also assume that the financial sector would generate net income 10% lower than the average for the last two years.

Owing to the falling economic growth, the public finance deficit started rising in 2008. The CNB's May 2009 forecast implies that the 3% Maastricht budget deficit threshold will be exceeded in both 2009 (4.3% of GDP) and 2010 (5.4% of GDP). By the CNB's estimation, the ratio of public debt to GDP rose by 0.9 percentage point to 29.8% in 2008 because of slower nominal GDP growth (see Chart II.17). Owing to a significant increase in public finance deficits, the public debt-to-GDP ratio will rise to 39% at the end of 2010 (CZK 1,440 billion in absolute terms). Of course, this will be accompanied by increased issuance of government bonds on the financial markets. Whereas the government's total gross borrowing need was CZK 145 billion in 2007 and CZK 190 billion in 2008, it could rise to CZK 250 billion in 2009 and as much as CZK 300 billion in 2010 given the projected growth in public finance deficits.

The widening fiscal deficit and rising government debt are increasing the risks to financial stability in the long run. For this reason, fiscal policy should pursue medium-term objectives and rely primarily on automatic stabilisers in the present recession. Given the declining growth rates of GDP, wages, profits, etc., the operation of these stabilisers leads to worsening public budget revenues and potentially to increasing public expenditure. This generates a growth impulse slowing the fall of the economy. Further budget-intensive demand-oriented fiscal expansion would probably be of limited effectiveness and could endanger fiscal discipline and ultimately also internal and external economic stability.

2.2 NON-FINANCIAL CORPORATIONS

The favourable situation in the corporate sector observed in previous years gradually deteriorated during 2008 and in early 2009. Declining external demand for exports of the Czech corporate sector as from mid-2008 caused problems with firms' sales and led to a decline in their income. In addition, corporations had to cope with a sharp appreciation of the exchange rate during 2008. They were probably unable to benefit fully from the subsequent depreciation in 2008 H2 because of a fall in projected exports and therefore in foreign currency income and hedging accepted in the past. This trend continued into 2009 Q1. As a result, there was a marked increase in the NPL ratio in the corporate sector compared to the previous two years. The risks to financial stability in the period ahead include falling external demand for Czech firms' products and a further increase in their insolvency. A subsequent decline in lenders' willingness to lend to non-financial corporations would further contribute to the decrease in overall economic activity.

The financial results of corporations for 2008 indicate a modest decline in return on equity and return on assets. This, however, was offset by still favourable results for the first half of the year. The corporate debt ratio showed only very modest growth, but value added decreased and wage costs rose significantly, resulting in a decrease in labour productivity in some industries. The asset turnover ratio and the inventory ratio increased owing to the reduced domestic and external demand. Problems with repaying corporate loans gave rise to an increase in the average collection period of corporations. At the same time, given the increased uncertainty surrounding their future revenues, firms cut back on investment activity and invested their free funds mainly in bonds. This fostered a rise in their balance-sheet liquidity indicators (see Chart II.18).

CHART II.17
Ratio of government debt to GDP
(%)
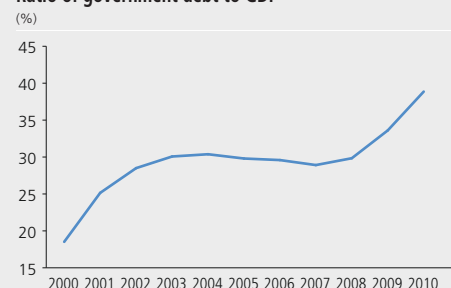
Source: CZSO, CNB
Note: The figures for 2009 and 2010 are CNB estimates

CHART II.18
Key financial indicators for non-financial corporations
(2007 = 100; index > 100 = improvement; index < 100 = deterioration)
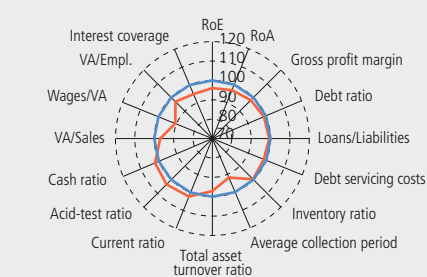
Source: CZSO, CNB calculation

CHART II.19
12-month default rate on bank loans to corporations and non-performing loan ratio
(%)

12-month default rate
1-month annualised default rate trend
NPL ratio

Source: CNB (CCR)

CHART II.20

Fall in net exports and rise in 12M default rate of export-oriented corporations
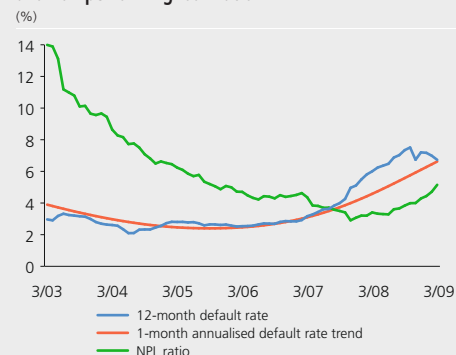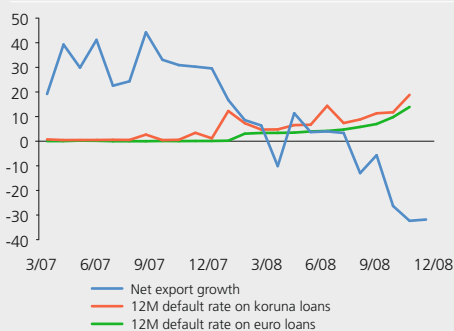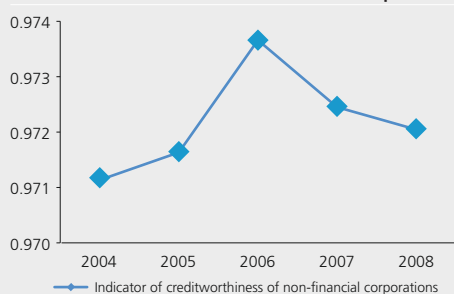
(%; data for 1,000 largest exporters)

Net export growth
12M default rate on koruna loans
12M default rate on euro loans

Source: CNB, CZSO, CNB calculation

CHART II.21

Indicator of creditworthiness of non-financial corporations

Indicator of creditworthiness of non-financial corporations

Source: CZSO, CNB calculation

CHART II.22

Number of bankruptcy petitions filed

(annual data)

Number of bankruptcy petitions filed
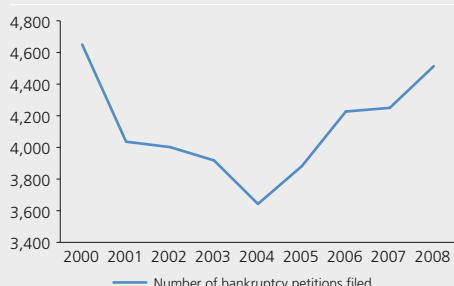
Source: Czech Ministry of Justice

CHART II.23

Credit growth

(monthly data; year-on-year growth in credit to corporations by number of employees in %)

1–9 employees
10–99 employees
100–249 employees
Over 250 employees
Corporate sector, total

Source: CNB (CCR)

2008 H2 saw a marked increase in the corporate sector's credit risk as measured by the 12-month default rate on bank loans to corporates, as a consequence of the falling external demand (see Chart II.19). At the start of 2007 this indicator had been moving around 3%, but at the end of 2008 it exceeded 7% and in 2009 Q1 it reached about 7.5%.[7] According to an internal CNB model, it should rise further in 2009 to 11% or even to 13% in the event of significantly adverse developments (see alternative scenario C in section 4.1.1).[8] The increase in the NPL ratio is reflected in deteriorating loan portfolios of banks.[9] The ratio of NPLs to total loans has been increasing since 2008 H2 (see section 4.1).

The decline in external demand had particularly a negative effect on export-oriented firms, which form the backbone of the Czech economy (see Box 2). This is illustrated by pronounced growth in the 12-month bank loan default rate among the largest exporters (see Chart II.20). Unlike in previous years[10], however, the default rate is also deteriorating among exporters with euro-denominated debts. This may also be partly due to the exchange rate depreciation in 2008 Q4.

The rising corporate sector risk is confirmed by the creditworthiness indicator, one of the forward-looking indicators of corporate sector stability.[11] Based on the aggregated financial results of non-financial corporations, this indicator assesses the corporate sector's overall financial condition, or the resilience of firms to default in the next year. It is calculated using seven financial indicators covering firms' profitability, liquidity, indebtedness and activity. The figures obtained show that the corporate sector's creditworthiness deteriorated further in 2008, although it was still better than in 2005 (see Chart II.21). The risk level of corporations was adversely affected by worsening profitability, a modest rise in debt and deteriorating activity. By contrast, the decline in creditworthiness was moderated by a rise in firms' balance-sheet liquidity.

The increased risk of default is confirmed by the number of insolvency petitions filed,[12] which increased by 6% year on year. Compared to 2007, however, the rate of growth of insolvency petitions increased by only 0.5 percentage point

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7 The 12-month default rate is calculated as the ratio between the volume of bank loans 30–89 days past due and average total outstanding loans in the 12-month period after the reference period. The calculation method implies that this indicator can only be accurate if one has information about the developments in the 12-month period after the reference period. As such information was not available in full when the calculations for the last year were made, an estimate is made for the last 11 months assuming a trend based on the average for the data already available. The calculations are based on data from the CNB-administered Central Credit Register, which contains data on the bank loans of legal entities.

8 A detailed description of the model applied can be found in Jakubík, P., Schmieder, C. (2008): Stress Testing Credit Risk: Is the Czech Republic Different from Germany? CNB WP 9/2008.

9 The forward-looking nature of the default rate means that loan portfolios would deteriorate substantially in 2010.

10 See Box 2 *Analysis of export-oriented corporations* in Financial Stability Report 2007, pp. 25–26, or Geršl, A.: Co ničí české exportéry? [What is Destroying Czech Exporters?] Euro, No. 35, 25 August 2008.

11 For more details about this indicator, see Jakubík, P. (2008): Scoring as an Indicator of Financial Stability, Financial Stability Report 2007, Czech National Bank, pp. 76–85.

12 All data on the number of insolvencies are from Creditreform statistics. For "insolvency petition" we will henceforth use the shortened term "insolvency".

(see Chart II.22). The impacts of the recession had by now started to be felt in full in Western European countries, where the number of corporate insolvencies increased by 11%. Among the economies hit hardest in this regard was Spain, where corporate bankruptcies rose by 139%, followed by Ireland (121%) and Denmark (55%). By contrast, Germany recorded a rise of only 2%.[13] Besides the modest growth in the number of bankruptcies, the absolute number of bankruptcies in the Czech Republic is also relatively low by international comparison. In 2008, there were 50 insolvencies per 10,000 corporations in the Czech Republic. The insolvency rate defined in this way is below average compared to both CEE countries and Western European countries.[14] However, some branches were hit much harder by the global economic decline. In 2008, the highest insolvency rates were recorded in the paper industry (233) and the textile and leather industry (220). They were followed by travel agencies (172), manufacture of glass, ceramics and construction materials (140), the food industry (123), manufacture of chemicals and plastics (122) and mining and quarrying (99).

The fall in domestic and external demand for corporate products was reflected in a modest decline in the annual rate of growth of corporate loans, from 17% at the end of 2007 to 14% at the end of 2008 and on to 10% at the end of 2009 Q1 (see Chart II.23). During 2009, in connection with the expected economic downturn, the annual growth rate of loans should see a further marked decrease to levels around zero. The economic decline is also indicated by a fall in industrial production in the Czech Republic in late 2008 and early 2009, in line with all other world economies. Given its small size and high degree of openness, the Czech economy is more sensitive to global developments than the large countries (see Chart II.24). The biggest falls in production occurred in transport equipment, machinery and equipment manufacture and in the textile and clothing industry. A decline in economic activity with modest signs of a recovery is also being signalled by new orders and direct export sales in industry and by domestic energy consumption (see Chart II.25). This trend is also consistent with a slowing decrease in toll collection, which, after year-on-year falls of 20% in January and 19% in February 2009, declined by only 9% in March. Although it is clear that Czech corporates will have to cope with a global fall in demand in 2009, they have a significant advantage in that they are less in debt at an aggregate level than euro area corporations (see Chart II.26). This should help them deal better with the new situation.

CHART II.24
Industrial production indices (seasonally adjusted)
(%; May 2001 = 100)

| CZ | Euro area | Japan |
| Germany | USA | |

Source: Datastream
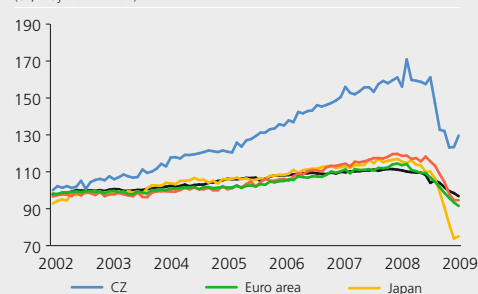
CHART II.25
New orders from abroad, direct export sales and domestic energy consumption
(monthly data; year-on-year indices in %)

Direct export sales
New orders from abroad
Domestic energy consumption

Source: CZSO

CHART II.26
Debt ratios of non-financial corporations
(% of GDP)

USA   EU-12   CZ

Source: Eurostat, US Bureau of Economic Statistics
Note: The debt ratio is calculated as the ratio of loans received and bonds issued from financial accounts to GDP

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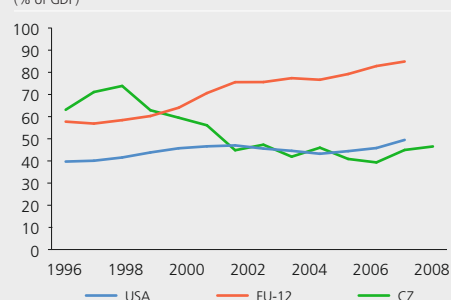
13 Some Western European countries even saw declines in corporate insolvencies (-17% in the Netherlands, -13% in Luxembourg, -2% in Switzerland).
14 The average for Western European countries is around 83 insolvencies per 10,000 corporations.

Relationship between export orientation of sector and NPL ratio
(data for 2008)
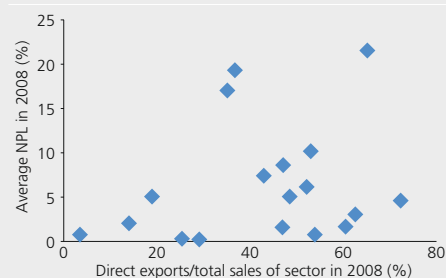
Source: CNB, CZSO

Box 2: Exporters, exchange rate volatility and hedging

The volatility of the Czech koruna exchange rate increased significantly in 2008. The strong appreciation trend in the first three quarters was replaced by depreciation (see section 2.1). In 2008 H2, this was accompanied by an emerging global economic recession, which led to a decline in external demand for Czech-made products. This combination had adverse effects on the financial condition of exporters. Many strongly export-oriented branches of industry recorded relatively high NPL ratios in 2008 (see Chart II.2 Box).

The depreciation in 2008 Q4 had only a limited positive effect on exporters because of the sharp fall in external demand. Corporations that had hedged against foreign exchange risk by means of derivatives contracts with domestic banks in the earlier period of koruna appreciation were unable to take advantage of the weaker exchange rate either.

The domestic currency volatility is increasing exporters' uncertainty regarding koruna export revenues. Exporters record lost revenues if the koruna appreciates and windfall revenues if it depreciates. However, most exporters use natural hedging (i.e. they cover currency risk by importing in foreign currency as well), so that the lost/windfall revenues relate only to net exports. Given the trend appreciation of the koruna, exporters hedge further by borrowing in foreign currency (the euro in particular) and by means of derivatives (futures, forwards, swaps and options).

Hedging with FX loans and derivatives also generates lost/windfall revenues. In the case of euro loans, these lost/windfall revenues always move in the opposite direction than in the case of exports. As for derivatives, it depends on the difference between the agreed and subsequent market exchange rates. Banks obtain hedging intermediation fees usually by offering exporters a future exchange rate 2%–4% stronger than the current forward exchange rate level.[15] It should be added, however, that the difference between the earlier agreed stronger exchange rate and the current (weaker) market rate represents a "virtual" hedging loss (i.e. lost revenues), not an actual loss. Derivatives hedging yields additional positive and quantifiable windfall revenues in a phase of fast and unexpected appreciation of the koruna, when the market exchange rate may be stronger than the rate stipulated in the derivatives. Hedging with derivatives thus protects corporations mainly against a sharp appreciation, not against a modest and expected gradual strengthening. However, foreign exchange risk hedging with derivatives also generates major benefits in the form of simpler planning of investment, production and demand for supplies of goods. Unlike lost/windfall revenues, these positive effects are relatively difficult to quantify reliably.

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15 Banks then close out the position at the market forward exchange rate and thus receive (in the future) only the fee realised in this way (see section 4.1).

The available information suggests that many firms had problems with overhedging in late 2008 and early 2009 due to falling export revenues. Owing to the koruna's weak exchange rate in this period, the virtual lost revenues from hedging became actual losses equal to the difference between the agreed derivatives volume and the actual (lower) export volume, as some firms had to buy the shortfall in foreign currency at a higher price in the market and sell more cheaply to the bank.[16] Although this is not a problem for the corporate sector as a whole, some firms could be strongly affected by these additional costs.[17]

2.3 HOUSEHOLDS

At the end of 2008, the economic slowdown started to affect the household sector as well. Last year saw a correction of the high growth rate of household debt seen in previous years, but also growing problems with repayment of household liabilities. A further worsening of households' solvency owing to a deteriorating labour market situation and a decline in their disposable incomes still poses a risk. The CNB's preventive action in the area of financial education should help mitigate negative economic effects on the household sector.

The increased uncertainty regarding future household incomes fostered a gradual slowdown in the high rate of growth of lending to households that had prevailed in the previous few years (see Chart II.27 and section 4.1).[18] In the case of consumer credit, the slowdown pertained mostly to loans from non-bank institutions, which rose by only 1% year on year in 2008 compared to almost 30% in 2007. Despite the slowing credit growth and a moderately falling ratio of interest paid to gross disposable income[19], total household debt increased to about CZK 950 billion at the end of last year (see Chart II.28). This amount is still due mostly to house purchase loans (about 65%), with bank consumer credit (about 20%) and non-bank loans (about 15%) accounting for the rest. The aggregate household debt ratios kept rising: the ratio of debt to gross disposable income was almost 50%, the ratio of debt to financial assets exceeded 30% and the debt-to-GDP ratio was roughly 25% (see Chart II.29). The debt-to-disposable income ratio of Czech households is about half that in the euro area countries, and the debt-to-GDP ratio is even lower.

Chart II.27
Annual growth in bank loans to households by purpose
(%)

Total
Consumer credit (including overdrafts)
Loans for housing purposes

Source: CNB

Chart II.28
Bank and non-bank credit to households
(CZK billions)

Bank loans for housing purposes and non-residential real estate
Consumer and other bank credit (including overdrafts)
Non-bank credit of a consumer nature

Source: CNB, CLFA

Chart II.29
Ratio of household debt to gross disposable income, financial assets and GDP; ratio of interest paid and net interest received to households' gross disposable income
(%)

Debt/gross disposable income (left-hand scale)
Debt/financial assets (left-hand scale)
Debt/GDP (left-hand scale)
Net financial assets/GDP (left-hand scale)
Interest paid/gross disposable income (right-hand scale)
Net interest received/gross disposable income (right-hand scale)

Source: CNB

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16 According to banks that are most active in this segment of hedging, the market value of exporters' hedging positions was in a loss of about USD 2–3 billion (at exchange rates of around CZK 29/EUR).

17 The situation was much worse in Poland in the same period. There, large exporters hedged using option strategies with high leveraging (see the Morgan Stanley Global Economic Forum of 23 February 2009). These option strategies protected exporters very cheaply at times of appreciation, but create substantial losses at times of depreciation and falling revenues.

18 New loans to households decreased in absolute terms (see section 4.1).

19 Although interest rates on new loans increased slightly (by about 1.5 percentage points), the ratio of interest paid to gross disposable income decreased. This was a result of a decrease in credit growth and a rise of about 8% in disposable income in the course of 2008. The ratio of interest received to disposable income fell slightly as well. Overall, however, the decline in interest paid exceeded that in interest received and the household sector's net interest income increased as a percentage of disposable income.
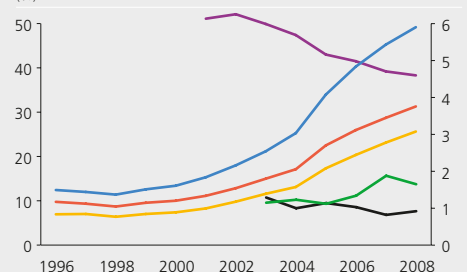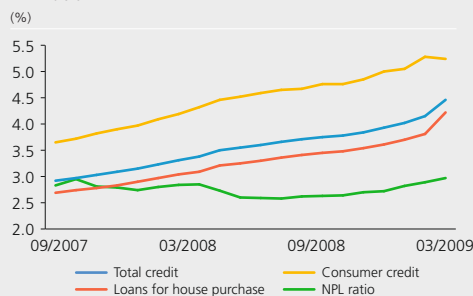
Source: Czech Credit Bureau, ČNB

At the aggregate level, households still have more financial assets than liabilities and are net recipients of interest payments, although their net assets-to-GDP ratio is falling steadily over time as the debt rises. Given the expected decrease in growth, the aggregate household debt ratios should record only a very slight rise or even no change in 2009. The debt-to-gross disposable income ratio should increase by only about 1 percentage point in 2009. Unlike some other CEE countries, Czech households have virtually no foreign currency loans and are thus not exposed to foreign exchange risk (see section 4.1 and Chart IV.7).

The decline in economic activity is starting to be reflected in rising household sector credit risk. The 12-month default rate on bank loans to households is edging upwards (see Chart II.30). This indicator can be expected to increase from just above 4% at the start of 2009 to 7% at the end of 2009. A greater increase can be expected from 2009 H2 onwards, when the corporate sector's difficulties will start to manifest themselves fully in the household sector. In a highly unfavourable scenario (see alternative scenario C in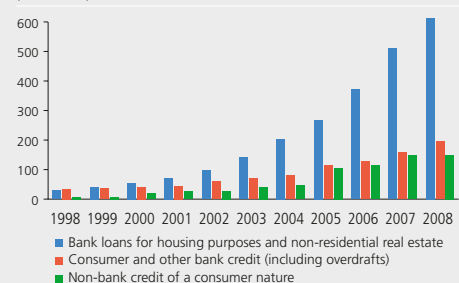 section 4.1), this indicator could reach 10% by the end of 2009. The future trend will be correlated with expected unemployment growth and its knock-on effect on households' disposable income (see Box 3). The higher default rate will gradually also lead to a growing share of NPLs to households in bank portfolios.

CHART II.3 (Box)
Households' debt burden
(percentages of net money income; %)

Source: CZSO

CHART II.4 (Box)
Problems making housing loan repayments in individual income groups
(%)

Source: CZSO

Box 3: Households' debt burden and loan repayments

An analysis was conducted of households' debt burden and loan repayments using CZSO statistics.[20] A natural disadvantage of the data used is that they are for 2007, which was characterised by peaking economic growth, albeit in a situation of rising interest rates, so they do not cover the sharp deterioration in the economic situation in the Czech Republic due to the global financial and economic crisis in late 2008.

The survey reveals that consumer credit and loans for house purchase are used by 21% and 10% of households respectively. The volume of loans of high-income households is traditionally several times higher than that of low-income households and it increased significantly further in 2007.[21] The debt burden, as measured by the ratio of repayments to net money income, increased by 0.3 percentage point to 4.6% in 2007.[22] Compared to the previous period it increased in the five highest-income deciles and in the second and fourth deciles. Over the last three years it has been highest in the tenth decile (see Chart II.3 Box). This income group also
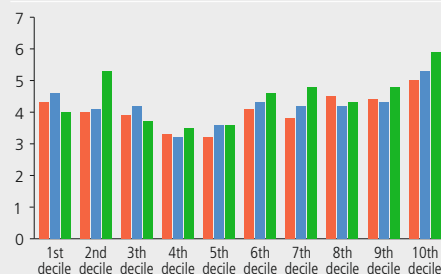
[20] These statistics come from the recently published results of the EU-SILC survey "Household Income and Living Conditions 2007" and the results of the household budget survey "Expenditures and Consumption of Households Included in Household Budget Survey in 2007".

[21] In 2007, the average volume of loans received per person was CZK 2,371 in the first income decile and CZK 21,980 in the tenth income decile.

[22] According to the household budget statistics, which are available for 2008 Q4 for total households only, the debt burden was also 4.6%.

had the highest saving rate (10.6%, compared with -3.4% in the first income decile). However, the strong economic growth and favourable labour market situation in 2007 also meant that despite a rising debt burden the share of households having problems making loan repayments decreased to about 2% in 2007 in most income groups (see Charts II.4 and II.5 Box). Consumer credit was a burden for almost all households in 2007 – a heavy burden for 26% of households and some burden for 66%, which suggests that repayment of this type of credit could deteriorate significantly in the future. The survey also revealed that 63% of households had difficulty making ends meet with their income. This was a problem particularly in the three lowest-income groups.

Although the above indicators in 2007 were not yet indicating increased loan repayments problem, it is reasonable to assume that the downswing in economic activity and rising unemployment has increased the pressure on the financial situation of households in 2008 and 2009. This is already evident from a sharp deterioration in the consumer confidence indicator.

CHART II.5 (BOX)
Problems making consumer credit repayments in individual income groups
(%)

Source: CZSO

Besides the risk of a considerable worsening of the labour market situation, a decline in nominal wages in some employee segments may also pose a risk in 2009 (see Chart II.31). The budgets of about 40%–60% of households with debt burdens would probably get into deficit were their nominal incomes to decrease by more than 10% (see Box 4). This could happen as a result of a shorter working week or cutbacks in variable wage components. In such a situation, the number of insolvencies would rise sharply and the quality of banks' loan portfolios would fall. This would lead to a decline in residential property prices due to the sale of collateral. A decrease in the value of collateral (or a fall in the LTV ratio) would increase the risk to which banks are exposed (see the sensitivity stress test of house purchase loans in section 4.2).

The adverse economic situation should foster a rise in the total saving rate of households, which will have an adverse effect on consumption. By contrast with the USA, the UK and some euro area countries, however, consumption in the Czech Republic is not linked too closely to asset prices, since households hold only a small proportion of their assets in the form of securities (see section 4.1) and make minimal use of consumer credit secured by property. This means that the unfavourable evolution of asset prices will have only a limited effect on household consumption.

CHART II.31
Nominal incomes, unemployment and inflation
(%)

Source: CreditReform s. r. o.
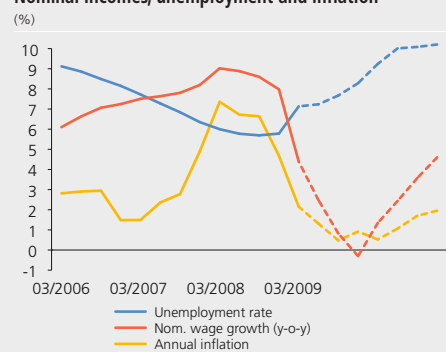
Box 4: The impact of falling nominal wages and rising interest rates

Given the sharp fall in economic activity, the potential decrease in nominal wages in the Czech economy during 2009 can be regarded as a relatively high risk to financial stability. The aim of the analysis below is to identify the decrease in households' nominal income that would cause a massive rise in loan defaults by households at the aggregate level and prompt a collapse of the mortgage market. The level of interest rate growth with similar effects is identified analogously. A CZSO survey (see Box 3) reveals that about 10% of households are repaying mortgage loans and 21% are repaying consumer credit. This means that the analysis covers a significant part of the sector.[23]

To quantify the effects of wage and interest rate shocks we consider two variants of a typical indebted household. In the first case, the household is only repaying a mortgage loan and in the second case it is repaying both a mortgage loan and a consumer loan. Both are being repaid in regular monthly instalments and have typical characteristics.[24] In both cases we assume a three-member family with one child and monthly essential living costs of CZK 15,000.[25] Another assumption is that both parents work. One works only part time and has a nominal monthly income amounting to two-thirds of the income of the other parent.[26]

In both cases we assume that the household is repaying a mortgage loan of CZK 1.5 million, which roughly corresponds to the average outstanding amount per mortgage in the Czech Republic. In the second variant we additionally consider the repayment of a consumer loan of CZK 100,000 / CZK 300,000.

For both variants we tested the impacts of a wage or interest rate shock on hypothetical family budgets in relation to initial nominal incomes assuming constant essential living costs. The results show that if households with a mortgage had no other loan, the budgets of about 40% of them would get into deficit if nominal wages declined by more than 10% or if interest rates increased by more than 3 percentage points. If this group of households also had a consumer loan of CZK 100,000 (CZK 300,000), around 50% (60%)

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23 Statistics on the intersection of these two groups are not available. Based on knowledge of the income distribution of households with mortgages according to the household budget statistics, we estimated the total proportion of households unable to repay their monthly liabilities.

24 We assumed a 20-year maturity for the mortgage loan and an interest rate corresponding to the average rate on mortgages with fixations of over 5 years at the start of 2009. For the consumer loan, we assumed a 5-year maturity and an interest rate corresponding to the average rate on such credit at the start of 2009.

25 In reality, however, one should take into account that households may also have extraordinary expenses, so it is not possible to cover essential costs only.

26 For both variants we assume a family corresponding to the typical mortgage recipient in the Czech Republic. According to CZSO data, this is most often a household with two economically active members and one child. The main breadwinner is a 39-year-old man with secondary education. His partner is a 33-year-old employee or housewife with secondary or basic education. Essential living costs can be estimated on the basis of the household budget statistics from expenditure on food, clothing, housing, health, transport and restaurants. This expenditure can alternatively be estimated as the sum of the minimum subsistence amount and normative housing expenses as stipulated in a government order of 16 December 2008. In both cases, the estimated amount is about CZK 15,000.
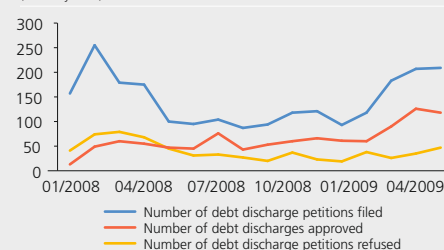
of them would be hit. These estimates of the proportion of households having difficulty making loan repayments are extreme, however. In reality, the percentage of households in difficulty would be much lower. For example, the assumption of constant living costs is very conservative, since households can in reality cut their living costs to some extent if needed. A large proportion of households, moreover, can cope with a potential bad situation by selling their assets (bank deposits, life insurance, private pension schemes, building saving schemes) or are insured against the inability to repay debts.

A new Insolvency Act, introducing the option of debt discharge for private individuals (personal bankruptcy), took effect on 1 January 2008. Overindebted individuals gradually started to make use of this option last year. After a surge in interest in the initial months after the Act took effect, the number of discharge petitions filed fluctuated around 100 a month between May and December 2008. The start of 2009 saw a gradual increase, with more than 200 petitions being filed in April (see Chart II.32). The petitions are assessed by the courts, which then rule on whether to allow discharge. The number of such cases can be expected to increase as this instrument becomes increasingly used by overindebted households during the economic recession, which will have a negative effect on disposable income. An international comparison suggests that the number of personal insolvencies could run to 8,000–9,000 a year in the Czech economy.[27] Should the rate of growth of the number of petitions filed in 2009 Q1 be maintained, this level would be reached in 2010 H1. Numerous non-profit advisory centres specialising in providing assistance to overindebted individuals and helping people to complete the petition form are playing a positive role.[28] Most of their clients are aged between 30 and 40 and have secondary education, an average monthly income of around CZK 25,000 and an average debt of less than CZK 300,000.[29] The commonest causes of insolvency include taking on too many liabilities, loss of employment, business liabilities, sickness and divorce/separation. Prevention in the field of financial education area is also important from this perspective. The CNB is active in this field as well. In particular, it supports the teaching of financial literacy in schools. In August 2008, the CNB distributed a new textbook on financial and economic literacy to primary schools and academic secondary schools (M. Skořepa, E. Skořepová (2008): Finanční a ekonomická gramotnost [Financial and Economic Literacy], Prague, Scientia).[30]

CHART II.32
Discharge of debts of private individuals
(monthly data)

Number of debt discharge petitions filed
Number of debt discharges approved
Number of debt discharge petitions refused

Source: Creditreform s.r.o., CNB calculation

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27 In Western European countries, there are 14 personal insolvencies per 10,000 people a year on average. However, the situation is very mixed across individual countries, depending on legislation and traditions. A high number of personal insolvencies is especially typical of the UK and Germany, while the Nordic countries of Western Europe have a very low number.

28 The situation of individuals who have accepted a loan, the potential impacts of repayment problems, and the solutions available are described in the Annex: *Options and solutions for overindebted households.*

29 These data were obtained from the Financial Difficulties Advisory Centre, but they correspond with information from other non-profit institutions that provide assistance to overindebted households.

30 The CNB, together with centres for the further education of teaching staff, subsequently started organising seminars on financial literacy for teachers in various regions of the Czech Republic led by the textbook's authors.
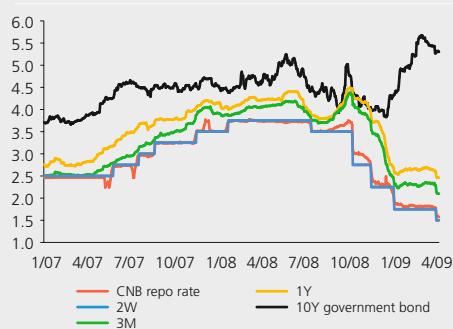
CHART III.1
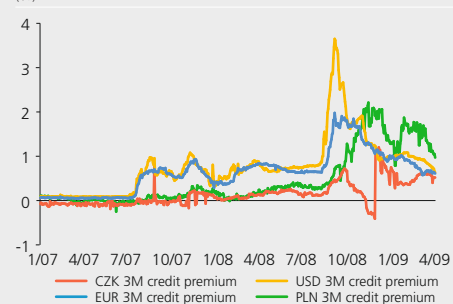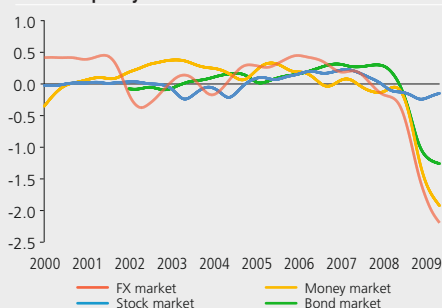**Short-term interest rates vs. 10-government bond yield**
(Czech Republic; %)

CNB repo rate — 1Y
2W — 10Y government bond
3M

Source: Thomson Datastream

CHART III.2
Credit premia on the interbank market
(%)

CZK 3M credit premium — USD 3M credit premium
EUR 3M credit premium — PLN 3M credit premium

Source: Bloomberg, Reuters, CNB calculation
Note: The credit premium is calculated as the difference between the 3M interbank rate and the 3M OIS of the relevant currency. The fall in the credit premium in the Czech Republic in January 2009 was caused by a fall in the OIS of 150 points on 7 January 2009. The fall reflects only reduced market liquidity and the overall shallowness of the OIS market.

CHART III.3
Market liquidity indicators for individual markets

FX market — Money market
Stock market — Bond market

Source: CNB, Bloomberg, Thomson Datastream, CNB calculation

3 ASSET MARKETS AND THE FINANCIAL INFRASTRUCTURE

3.1 THE FINANCIAL MARKETS

The financial market situation seemed to be stabilising gradually in the first three quarters of 2008. However, the crisis events in September and October had a strong impact on the various segments of the financial markets in virtually all the market economies, including the Czech Republic. The functioning of the Czech interbank market and the Czech government bond market changed significantly. Market liquidity decreased and market volatility increased sharply. This had an adverse effect on balance-sheet liquidity risk. The situation has gradually stabilised, however, and investment in Czech assets is still considered less risky by investors than investment in assets of the other Central European countries. A major risk which could worsen the situation on the Czech financial markets going forward is continuing increased risk aversion to the Central European region in line with the pessimistic expectations regarding its economic development, and the insufficient distinction being made between the individual countries of this region. Inadequate measures taken by key institutions to bolster the liquidity and capital of banking systems could be another, no less significant risk to the financial markets, although it is relatively small in the Czech case.

The situation on world financial markets, including interbank money markets, gradually calmed between the start of last year and September. On the Czech money market, the bid-offer spread stayed at around 10 basis points at all maturities, the spread between the monetary policy rate and interbank rates moved at its usual levels (see Chart III.1) and the credit premium remained close to zero (see Chart III.2). In mid-September, however, the situation started to deteriorate significantly on all major money markets. The collapse of US investment bank Lehman Brothers contradicted the widespread perception that it was impossible for a too large financial institution, or an institution whose balance-sheet is too strongly interconnected with other institutions, to default. The financial markets experienced increased uncertainty regarding the possible failure of other financial institutions as counterparties to transactions. This resulted in a significant rise in the credit premium (see Chart III.2).

Immediately after this event, owing to the high degree of international integration (see Box 5), the situation on the Czech money market also worsened slightly. Bid-offer spreads widened at all maturities to 20–35 basis points, all interbank rates with longer maturities started significantly exceeding the monetary policy rate, trading decreased at maturities longer than one week and activity was concentrated mostly in the overnight segment.[31] Although the CNB lowered its monetary policy rate several times (cumulatively by 2.25 percentage points since August 2008), money market rates reacted more slowly than usual (see Chart III.1) because of a rise in the credit premium (see Chart III.2). Rates with longer than two-week maturity actually rose in 2009 Q1, mainly due to a marked increase in the risk premium (see section 2.1). The functioning of the monetary policy interest rate transmission channel is thus currently disrupted to some extent, owing to the different evolution of market and client rates (see section 4.1).

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31 In April 2008, O/N contracts accounted for about 74% of all money market transactions in the Czech Republic (87% of transactions with residents), whereas in October the figure was 91% (97% of transactions with residents). In April 2009, O/N contracts accounted for 81% of all money market transactions (81% of transactions with residents).

Concerns about fund availability and lack of confidence in financial institutions (money market funds in particular) stimulated a hoarding of liquidity. The liquidity absorbed in two-week repo tenders decreased (see Box 5) and currency in circulation increased (see section 3.3). Liquidity fell sharply on the money market (see Chart III.3).[32]

Box 5: The market indicator of balance-sheet liquidity

This box describes the construction of a market indicator of balance-sheet liquidity (MIBL) from data on banks' bids in the CNB's repo tenders, which take place three times a week. We start by assuming that a bank's behaviour in a tender (i.e. both the volume bid and the interest bid) is a function of its balance-sheet liquidity. In systems where banks traditionally demand liquidity from the central bank (e.g. in the euro area), banks with deteriorating balance-sheet liquidity will bid higher amounts more aggressively at an interest rate which is further from (higher than) the set (minimum) limit rate. In the Czech Republic, where the CNB traditionally absorbs liquidity from banks, banks will be less willing to deposit their liquidity with the CNB for two weeks in the case of deteriorating balance-sheet liquidity and will do so only at the maximum (limit rate).

The construction of the Czech MIBL is based on applying the approach used by Drehmann and Nikolaou (2009), who construct this indicator for the euro area.[33] The calculation is performed for each bank i and each day of tender t according to the equation below, which combines information about the spread between the maximum repo rate and the bid rate and about the relative bid volume to the total liquidity absorbed, i.e.[34]

$$MIBL_{it} = \log\left(1/\left(\frac{(repo\_rate_t - bid\_rate_{it}) \cdot volume_{it}}{total\_volume_t} + \varepsilon\right)\right).$$

The bid volume must be weighted by the total volume absorbed to capture factors leading to a change in the bid volume that are not caused by a change in balance-sheet liquidity and are common to all banks (e.g. a change in the repo rate or generally lower tender volumes). For clearer interpretation the MIBL was calculated as inverse and logarithm.[35] Higher MIBLs thus indicate a greater risk of an outflow of balance-sheet liquidity.[36]

Chart III.1 (Box)
Relationship between balance-sheet liquidity ratios and the MIBL
(x-axis: average ratios; y-axis: MIBLs)

■ Before 09/08   ■ After 09/08
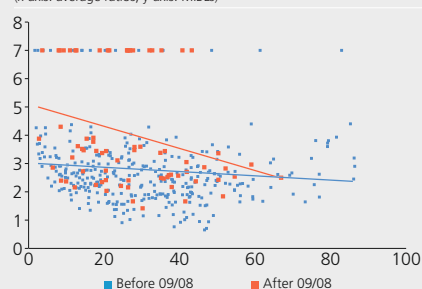
Source: CNB, CNB calculation
Note: The observation with an MIBL equal to 7 is due to the transformation of the observation with a zero difference between the bid and limit rates. Three ratios were included in the average (x-axis): quick liquid assets to total assets, quick liquid assets to liabilities and quick liquid assets to deposits.

Chart III.2 (Box)
Market indicator of balance-sheet liquidity (MIBL)
(daily data)

05/07 08/07 11/07 02/08 05/08 08/08 11/08 02/09
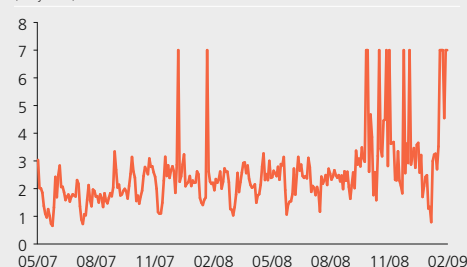
Source: CNB, CNB calculation

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32 The construction of the liquidity indicator is described in detail in Box 4 of the 2007 Financial Stability Report.
33 Drehmann, M., Nikolaou, K. (2009): Funding Liquidity Risk: Definition and Measurement. WP Series No. 1024, European Central Bank, March 2009.
34 If a bank made more than one bid in a single tender or if more than one tender took place in a single day, the bids were averaged.
35 ε is a very small number ensuring the existence of an inverse value for numbers close to zero.
36 The MIBL indicator ranges between 0 and 7. It takes the highest value of 7 if a bank enters repo tenders with the CNB at the limit rate, i.e. the highest possible rate. This behaviour is interpreted as increased concern about a lack of liquidity on the part of the bank.

CHART III.3 (BOX)
Relationship between balance-sheet liquidity (MIBL) and market liquidity
(x-axis: market liquidity indices; y-axis: aggregate MIBLs; daily data)

Before 09/08   After 09/08
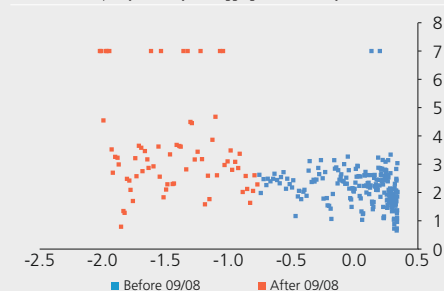
Source: CNB, CNB calculation

CHART III.4
Volatility on domestic and foreign financial markets
(historical volatility over past 90 days)

Volatility index (CZ, right-hand scale)   Volatility index (global)
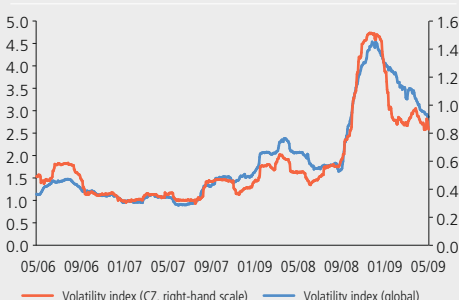
Source: Reuters, Thomson Datastream, CNB calculation
Note: Global volatility index = sum of historical volatility of S&P500, DJ Stoxx50, USD/EUR and YEN/USD rates, German and US 10Y government bonds, gold price, oil price and 3M EURIBOR and 3M LIBOR over past 90 days. Czech index volatility index = sum of historical volatility of PX stock index, CZK/EUR rate, 10Y government bond and 3M PRIBOR.

CHART III.5
Composite market liquidity indicator for the Czech financial market
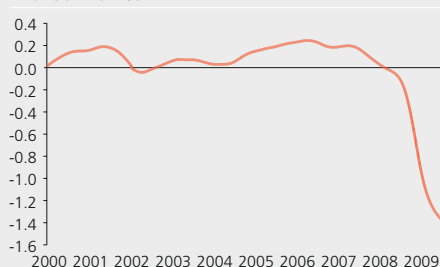
Source: CNB, Bloomberg, Thomson Datastream, CNB calculation

Chart III.1 (Box) shows the monthly average MIBLs as a function of the average traditional balance-sheet liquidity indicators for the previous month (the ratios of quick liquid assets to assets, liabilities and deposits) and confirms some negative correlation between the ratios and the MIBL. The chart also shows that banks' unwillingness to deposit their liquid funds in repo tenders with the CNB has increased since last September (MIBLs reaching 7) and that the negative relationship between the two indicators has strengthened (the red line).

If we aggregate the MIBL across all banks, we obtain an indicator measuring the risk of an outflow of balance-sheet liquidity for the banking sector as a whole. Chart III.2 (Box) shows that this risk increased primarily in 2008 Q3, when banks' interest in entering tenders with the CNB decreased, and if they did enter them it had to be at a price close to the maximum rate. The indicator suggests increased concerns regarding a shortage of liquid funds on the market and the hoarding of liquid funds by banks in response to the worsening market situation following the September events. The liquidity problems, which peaked at the end of last year, can also be seen by comparing the aggregated MIBL with market liquidity. Chart III.3 (Box) confirms some correlation between market and balance-sheet liquidity and shows that the risk of an outflow of balance-sheet liquidity increased in the Czech Republic after the collapse of Lehman Brothers in September 2008. At the same time, there was a strong decline in market liquidity (see Chart III.5).[37]

The autumn events hit not only the money market, but also other segments of the financial market. The increased uncertainty and risk aversion afflicting global financial markets since mid-2007 strengthened even further, resulting in much higher volatility (see Chart III.4) and lower liquidity (see Chart III.5).[38] The domestic volatility index largely tracked the global volatility index.

Market liquidity problems were also observed in the Czech government bond market (see Chart III.3). In mid-October 2008, in a situation of excess government bond supply on the market, particularly on the part of foreign institutional investors, market-makers' bid-offer spread widened from the usual 20 basis points to about 300 points. This wide spread temporarily almost paralysed trading in this market via market-makers. The trading volume on the secondary government bond market did not fall, however. Trades continued to be carried out through brokers. Overall, the volume of trading in government bonds increased by 26% year on year to CZK 643 billion in 2008.[39]

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37 The relationship between market and balance-sheet liquidity is also used in Box 9 *Stress testing of banks' balance-sheet liquidity* in section 4.2.

38 For the evolution of the market liquidity indicator in the euro area, see Financial Stability Review, ECB, December 2008, p. 61.

39 Excess market supply of government bonds and deteriorating market liquidity in this market were also recorded in other EU countries outside the EMU. This may have been partly related to a change in the range of collateral accepted by the ECB for operations in the Eurosystem. Increased demand for liquidity by commercial banks increases the demand for eligible collateral accepted by the ECB and, by contrast, increases the supply of other high-quality securities, including government bonds denominated in the Czech koruna.

The CNB responded to the minimal activity on the interbank money market, the frequent fluctuations in participation in CNB sterilisation operations, the increased short-term interest rate volatility, the concentration of liquidity in a small group of banks and the deteriorating situation in the Czech government bond market by introducing liquidity-providing repo operations. This new type of operation allowed government bonds to be accepted as collateral (in addition to short-term bills) and helped ease market participants' concerns regarding the potential illiquidity of these securities. Price-setting on the government bond market recovered at least partially with about a one-week lag.

The money and bond market situation both at home and around the world calmed only at the end of 2008 after key world institutions responded by providing liquidity to non-banking institutions, most notably money market funds. Credit premia and market volatility decreased in response to these measures, but are still rather high (see Charts III.2 and III.4).

The increased government demand for savings linked with the funding of the financial sector and with the stimulation of demand raise questions about the markets' ability to absorb the greatly increased government debt issues in the years ahead and the risk of private entities being squeezed out of the market. The governments of advanced countries have not yet recorded any major difficulties with debt financing, although they are meeting with increased volatility of demand for their issues. The impact of rising issues of government and government-guaranteed debt on interest rates has so far been highly asymmetric. Large countries, including those which are already heavily in debt or whose debt is expected to grow markedly, have not yet registered any rise in demanded returns (see Chart III.6). Paradoxically, this may reflect the fact that the government debt of these countries is viewed as a relatively safe asset. By contrast, some smaller advanced countries, including the Czech Republic, are exposed to an increase in the returns demanded on government debt (see Chart III.7). The indirect squeeze-out effect resulting from rising interest rates is thus more of a threat for smaller and heavily indebted economies. Even in these countries, however, the rise in interest rates does not necessarily reflect a growing public debt financing need but rather a general increase in perceived country risk.

In the short run, the growing government debt issuance and issuance of government-guaranteed bank debt may, amid increased risk aversion and worse functioning of the financial markets, worsen the conditions and raise the costs of private entities' issues. A specific type of squeeze-out may then arise, with large private firms decreasing their financing via bond issues and instead raising funds by borrowing from banks, which raise funds by issuing bonds guaranteed by the state. Such banks will then have less funds at higher prices for smaller firms.

The rising government demand for debt financing need not automatically lead to medium- and long-term growth in global real interest rates. This is because of an expected fall in private entities' demand for debt financing or an increase in the private saving rate. Part of the current increase in the saving rate to the detriment of consumption, which can be explained by the precautionary motive in a strong recession, will probably be only temporary. However, the private saving rate in Western economies can be expected to move at higher levels than in the previous

CHART III.6
Ten-year government bond yields for selected developed countries
(15 January 1999 = 100; monthly averages)

Source: Thomson Datastream, CNB calculation
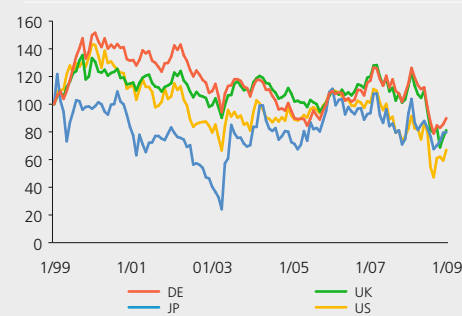
CHART III.7
Yield spreads on ten-year government bonds for selected countries
(%; monthly averages)

Source: Thomson Datastream, CNB calculation
Note: Yield spreads on 10-year government bonds of selected country relative to German 10-year government bonds.
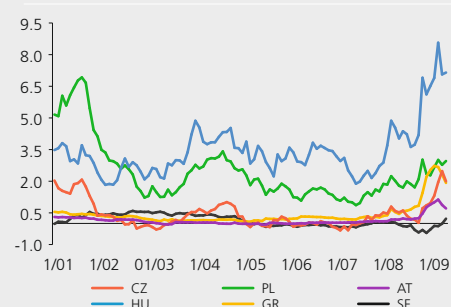
CHART III.8
Credit default swap spreads for selected European governments
(b. p.)

Source: Thomson Datastream
Note: 5Y CDS spreads; for data reasons Malta, Cyprus, Bulgaria, Estonia and Latvia were not included in the average.
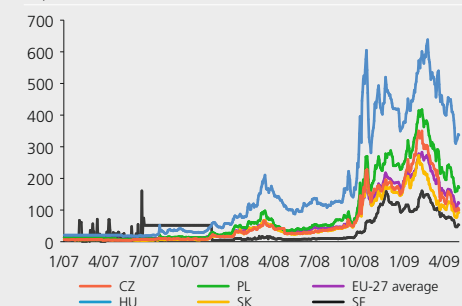
ten years after the recession comes to an end. By increasing their savings, households will try to offset at least partially the deterioration in their balance sheet caused by the fall in asset prices and at the same time reduce their overleveraging.[40]

The behaviour of part of the corporate sector will be similar. If the private supply of savings grows by more than the government demand for savings, long-term global equilibrium real interest rates might even decrease. The observed rise in real corporate bond yields (see section 2.1) can then be interpreted as a marked increase in current interest rates above their long-term equilibrium level due to a sharp increase in credit risk.

The deteriorating financial market situation affected different countries in different ways. The increasing differences in perceived risk across countries (see section 2.1, Chart II.11) influenced investors' investment allocation decisions. The differing perceptions of countries are reflected not only in historically higher differences in government bond yields (see Chart III.7), but also in various levels of investors' country risk aversion in the form of differences in credit default swap spreads for government bonds (see Chart III.8). The spread between Czech and German government bond yields is still far lower than in the case of Hungary or Poland, for example. This may suggest that foreign investors regard investing in these countries as more risky than, for example, investing in Czech assets.[41] An analysis of financial integration using news-based measures arrives at similar conclusions (see Box 6).
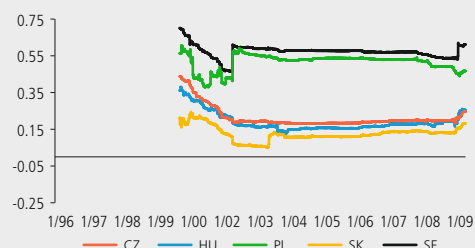
Box 6: News-based measures of financial integration[42]

An important sign of financial market integration[43] is that asset prices respond to common (global) news rather than to local news, i.e. news typical of a specific country. Local shocks, be they in the form of positive or negative local news, thus do not pose a systematic risk to integrated markets, since the latter are diversified by investment in assets from other regions. Easy diversification of systematic risk is possible thanks to barrier-free investment across the integrated region. If markets are financially integrated, yields on financial assets of different countries, but having the same risk characteristics, should depend on global rather than local news. News-based measures of financial integration are based on this

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assumption – see Baele et al. (2004).[44] In line with these assumptions, the price movements of a benchmark asset should reflect all relevant common (global) news. Thus, in a fully integrated market, the price changes of an asset in a single country should not be systematically higher or lower than the price changes of the benchmark asset. The quantification of the degree of integration of shocks can be estimated using the following regression:

$$\Delta\, r_{i,t} = \alpha_{i,t} + \gamma_{i,t}\,\Delta\, r_{b,t} + \varepsilon_{i,t}$$

where $r_{i,t}$ represents individual asset yields (exchange rates, interbank interest rates, government bonds, national stock indices) in country i at time t, and b denotes the benchmark country (Germany for the government bond market, otherwise the euro area). $\alpha_{i,t}$ is a specific constant for each country, Δ denotes the difference operator and $\varepsilon_{i,t}$ is an error term. Growth in this type of integration requires α to converge to zero and γ to one. The time-variable parameters γ were estimated using recursive estimation.

The magnitude of parameters γ expresses the degree of identical response of an asset of a selected country and a comparable benchmark asset to certain news. Simply stated, parameter γ shows to what extent an asset of a selected region responds to news in the same way as the benchmark asset, assuming that the benchmark asset responds to global news only. The higher the value of the parameter, the higher the integration of the assets under comparison. As in reality credit, liquidity and foreign exchange risks are not identical across individual countries and assets, the change in the yield on a local asset is not expected to be explained fully and solely by the impact of global (common) news.

The empirical part of the box is focused on measuring the integration of financial markets in five countries, namely the Czech Republic, Hungary, Poland, Slovakia and Sweden, compared to the euro area, or Germany in the case of the government bond market. The estimated γ parameters for the individual markets and countries over time are presented in Charts III.4–III.7 (Box). The highest degree of integration for the Czech Republic measured using the above method was obtained for the stock and foreign exchange markets (see Charts III.5 and III.7). The γ parameters were around 0.4, as in the case of Poland. By contrast, the lowest degree of integration was achieved by the money market in the case of the Czech Republic (see Chart III.4, γ around 0.2), as in the case of Hungary, while Poland achieved a higher degree (around 0.4). To some extent, the degree of integration on the money market may reflect the alignment of the selected states' monetary policies with that of the euro area. Thus, idiosyncratic local news (a change in the monetary policy rate of the relevant state) may prevail far more on the money market than on the stock market. As regards the government bond market, the Czech Republic turned out to be the most integrated Central European country, with γ of around 0.35 (see Chart III.6).

CHART III.5 (BOX)
Evolution of γ on foreign exchange markets
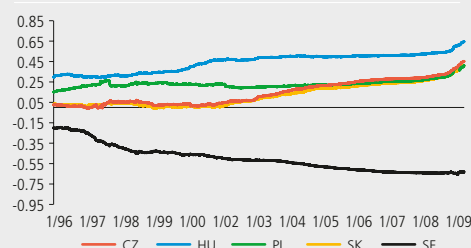
Source: Thomson Datastream, CNB calculation

CHART III.6 (BOX)
Evolution of γ on government bond markets
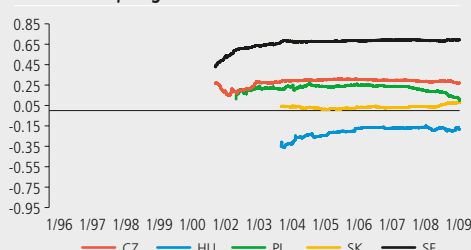
Source: Thomson Datastream, CNB calculation

CHART III.7 (BOX)
Evolution of γ on stock markets
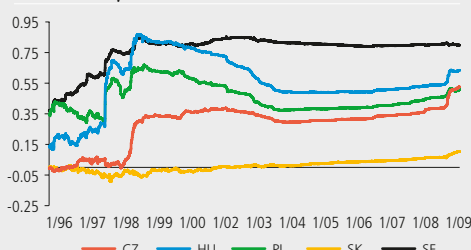
Source: Thomson Datastream, CNB calculation

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44 Baele, L., Ferrando, A., Hördahl, P., Krylova, E., Monnet, C. (2004): Measuring Financial Integration in the Euro Area. Occasional Paper Series, No. 14, European Central Bank, pp. 1–93.

Not surprisingly, the lowest, or negative, value was recorded for Hungary. The asymmetrical movement in Hungarian government bond yields compared to Germany indicates that news having a positive impact on German government bond yields negatively affects Hungarian ones. The integration of the Slovak stock and bond markets showed a very low value due to the shallowness of these markets (see Charts III.6 and III.7). By far the highest degree of integration, with the exception of the foreign exchange market, was recorded by the Swedish financial markets, in line with economic intuition. The inverse behaviour of γ in the case of the Swedish foreign exchange market reflects a negative relationship between the response of the krona and the euro with respect to the dollar. It may be said that the Swedish krona and the euro behave in these pairs as substitute assets. Global news thus has opposite effects on them.

Overall, stock markets are the most integrated on average for the selected countries (the highest γ on average), while government bond markets are the least integrated. Although γ shows relative stability over time for all the selected markets, it is rising slightly over time for the Czech Republic, Poland and Hungary (except in the government bond market). Sensitivity to the spread of news varies across the countries (various values of γ). This is due, among other things, to the differences in credit, liquidity and foreign exchange risks in the individual countries increasing at the start of the current crisis, or to the chosen monetary policy.[45] The lowest sensitivity is observed on average in Slovakia (although this is affected by the greatest shallowness of the individual markets[46]), followed by the Czech Republic and then Poland and Hungary (at roughly the same level), while the highest sensitivity is recorded for Sweden.

CHART III.9
Stock indices
(1 January 2007 = 100)
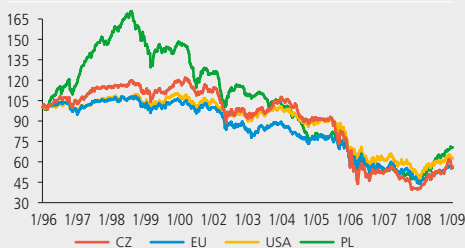
Source: Thomson Datastream, CNB calculation
Note: CZ = PX, EU = DJ STOXX 50, USA = S&P 500, PL = WIG80

CHART III.10
Share prices of selected banks and World Commercial Banks Index
(1 January 2007 = 100)

Erste Bank   Raiffeisenbank
UniCredit   Société Générale
Komerční banka   KBC Group
MSCI World Commercial Banks Index
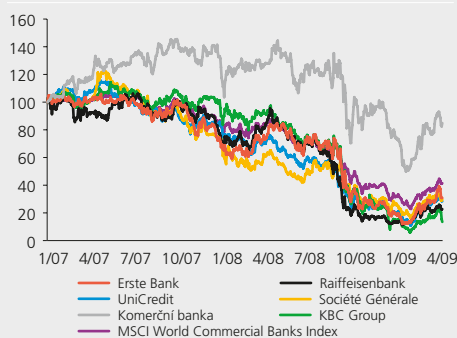
Source: Thomson Datastream, CNB calculation

While stock exchange indices fell sharply in October 2008, some stabilisation was recorded in late 2008 and early 2009, mainly in expectation of the effects of the new US President's anti-crisis measures and the anti-crisis packages of governments in various countries (see Chart III.9). However, the outlook for global economic growth remains highly uncertain (see section 2.1), so further price falls in major stock indices in the USA and Europe cannot be ruled out. The same goes for the Prague Stock Exchange's PX index, which at the start of March 2009 (the lowest value since the beginning of the crisis) was down almost 70% from its October 2007 peak of 1,936.10 points (see Chart III.9).

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45 Differences in monetary policy are evident, for instance, in the foreign exchange and money markets. For example, the γ of the Hungarian foreign exchange market significantly exceeds those of the other countries. The higher value may be due to the not entirely free exchange rate of the forint against the euro.
46 However, this is expected to grow following the introduction of the euro, as happened in other euro area countries (e.g. Greece).

As in the case of national stock exchange indices, the share prices of individual banks have been under selling pressure since October 2008 (see Chart III.10). The approved US rescue package was used not to clean up banks' balance sheets (by purchasing toxic assets), but to increase the capital of selected financial institutions. European banks, unlike US ones, have so far less been transparent in quantifying the true impact of the crisis on their balance sheets. The identification of further potential losses is likely to exert downward pressure on their share prices. Shares of domestic banks and parent banks of Czech banking institutions have not avoided falls, either; their balance sheets have been affected by the global financial crisis to only a limited extent and only indirectly (see Chart III.10 and section 4.1).

The significant fall in some banks' share prices may reflect other risks, such as declining confidence in the banking sector and its stability. There are also concerns that highly indebted or single-industry-oriented Central European economies may record a greater fall in economic growth than Western economies, which may threaten the stability of European banks specialising in this region (see section 4.1.1). This risk is reflected in a sharp increase in credit default swaps (one of the possible instruments for insuring against counterparty loan default) of some European banks operating in Central Europe (see Chart III.11[47]).

The effects of the ongoing global financial crisis were also observed on the foreign exchange markets. The episode of appreciation of more or less all the Central European currencies against the euro in mid-2008 turned around during the summer as investors started to offload these currencies (see Chart III.12). The quick sales of currencies by foreign investors were related mainly to the sale of assets held in these countries. The quick sales of currencies affected other European countries, too (see Chart III.12). However, compared to other European countries (Poland, the UK and Sweden) the Czech koruna depreciated the least in this period. The depreciation pressure on the Czech koruna went hand in hand with a sharp rise in volatility on foreign exchange markets due to the drying-up of market liquidity in these markets (see Chart III.3). Trading volumes shrank and markets became shallower. After the volatility of the Czech koruna against the euro decreased, the koruna started to appreciate again slightly against the euro in 2009.

The commodity market was also affected by the financial crisis, which strengthened in 2008 H2. While prices of energy-producing and industrial commodities fell in response to the global decline in economic activity, prices of precious metals – substituting for risky financial assets – increased (see Chart III.13).

To identify the risk of increased risk aversion to the Central European region and insufficient cross-country differentiation, which would materialise mainly in depreciation pressures, an alternative adverse scenario entitled "market nervousness" was constructed.

Chart III.11
Credit default swaps of selected European banks
(b. p.)

Source: Thomson Datastream
Note: Minimal exposure in CEE is represented by the average CDS of foreign banks with minimal or zero exposures in CEE. The banks included here are UBS, Credit Suisse, Deutsche Bank, Commerzbank, Barclays and BNP Paribas.
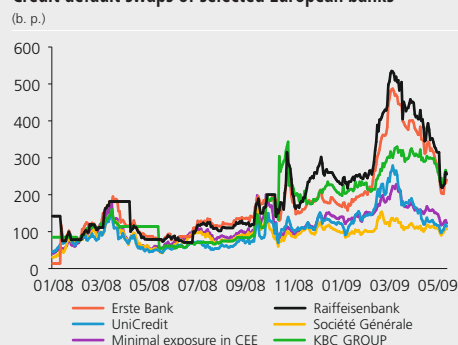
Chart III.12
Exchange rates of selected currencies against the euro
(1 January 2007 = 100)

Source: Reuters, Thomson Datastream, CNB calculation
Note: CZK/EUR volatility = historical volatility over past 90 days.
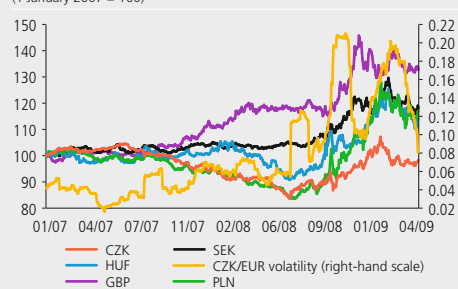
Chart III.13
Main commodity indices
(15 May 1998 = 100; monthly data)

Source: Thomson Datastream, CNB calculation

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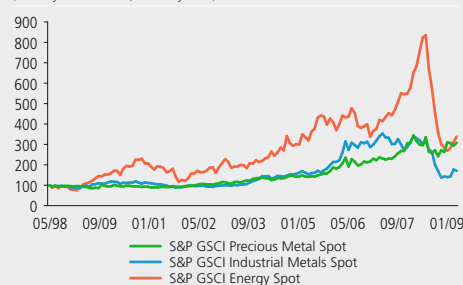
47 The Société Générale banking group has a lower ratio of CEE assets to its total assets than, for instance, Erste Group or Raiffeisenbank.

Alternative scenario B: "market nervousness"

Scenario B simulates a situation of a greater decrease in domestic and external economic activity combined with stronger depreciation pressures on the Czech koruna due to an increase in risk aversion to the CEE region. Real GDP would decline by almost 4% in 2009, while the exchange rate would temporarily exceed CZK 30/EUR. The significantly weaker koruna would exert stronger inflation pressures, to which the central bank would respond by sharply increasing interest rates. This would then help to partly correct the previous depreciation. The absolute decline in the domestic economy and the high interest rates would result in rising default rates in the non-financial corporation and household sectors, which in the case of corporations would be only partly offset by the pro-export effect of the weaker exchange rate. Overall credit growth would slow almost to zero, and share and property prices would show deeper declines. We also assume that, owing to the low economic activity, the financial sector would generate net income 20% lower than the average for the last two years.

3.2 THE PROPERTY MARKET

Prices continued to rise on the Czech housing market in 2008, despite declines in property prices in some advanced economies. The ratio of apartment prices to income increased. Apartment rental returns were still lower than interest rates on loans for house purchase. Given the worsening economic situation of households, a decline in prices of apartments in the period ahead cannot be ruled out. The number of apartments under construction keeps growing, which may mean a build-up of risks for the property development sector. This sector is still affected by a worsening situation on the commercial property market, with virtually all segments of the market seeing a combination of record-high planned supply and a decline in realised demand. This has led to an increase in the yields demanded on individual types of investment and a rise in the vacancy rate.

3.2.1 Residential property prices

The rapid rise in property prices observed in 2007 continued for virtually all types of residential property in the Czech Republic in 2008 (see Chart III.14). At the same time, the CZSO data on property transfer prices for 2007 and partly also for 2006 were revised upwards. High growth was recorded mainly for apartment prices (a year-on-year increase of 35% in 2007 H2) and building plots (a year-on-year rise of 25%), while slower growth (of about 13% and 4% year-on-year respectively)

CHART III.14
Property prices – transfer prices according to tax returns
(absolute index; 1999 Q1 = 100)
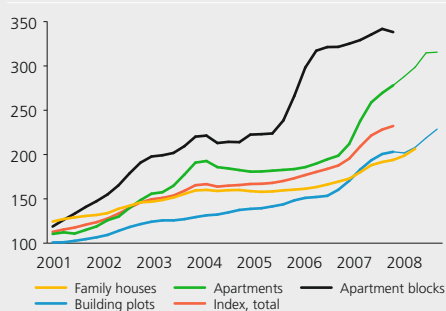
Source: CZSO, CNB calculation
Note: 2008 data preliminary or calculated from supply prices
(for prices of apartments and building plots)

was recorded for prices of family houses and apartment blocks, which, however, had risen very fast in previous years according to the revised data. Although the year-on-year price growth slowed in 2008, it remained relatively high overall (prices of apartments and building plots were rising by around 13% towards the end of the year, while prices of family houses and apartment blocks were increasing by roughly 10% at the end of H1). This price growth across the different types of property reinforced considerations of an overheating of the property market and a possible future decline in this market that were raised in the 2007 Financial Stability Report.

The property price growth in the Czech Republic in 2008 seemed fast compared to countries which had seen significant price increases in the recent past (see Chart III.15) and in which the global financial crisis manifested itself, among other things, in a relatively rapid decline in property prices last year. For example, property prices fell by about 20% in the USA, 15% in the UK, 10% in Ireland and 3% in Spain in 2008. Although property price inflation in these countries had been similar to that in the Czech Republic until 2007, the trend diverged sharply in 2008. Property prices in advanced economies which are geographically close to the Czech Republic and which are its major trading partners (Germany and Austria) have been broadly flat since the turn of the millennium.

Our estimate of comparable *price-to-income* and *price-to-rent* indicators for the Czech Republic[48] and for other economies (see Chart III.16) suggests that these indicators were lower in the Czech Republic in 2007 than in most countries with rapid price growth. The rise in apartment prices in the Czech Republic in 2007–2008 increased both indicators, shifting them to the right and upwards, but this was partly a process of catch-up with the level common abroad. Even after a decline in both indicators in response to the fall in property prices abroad in 2008, these indicators should remain slightly lower in the Czech Republic. On the other hand, they are higher than those of the Czech Republic's major trading partners.

Available supply prices indicate slowing year-on-year growth in apartment prices in 2008 and early 2009 (see Chart III.17). This might be linked with the economic slowdown and the related tightening of the conditions for house purchase loans. According to some sources, prices have started to flatten out year on year (IRI data). The fall in annual growth in supply prices in 2008 H2 is related mainly to base effects and seems relatively insignificant. However, signs of a decline in absolute supply prices appeared in 2009 Q1. Chart III.17 also shows some convergence of prices between Prague and the rest of the Czech Republic, with both supply and transfer prices growing faster outside Prague.

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48 For the advanced economies, the *price-to-income* and *price-to-rent* indices in Chart III.16 are related to their long-run averages for 1990–2006, while the indices for the Czech Republic are compared to their averages for 2000–2006. The shorter period for the calculation of the averages for the Czech Republic places some limitations on their comparability.

CHART III.15
Property prices – international comparison
(absolute index; 1999 Q1 = 100)
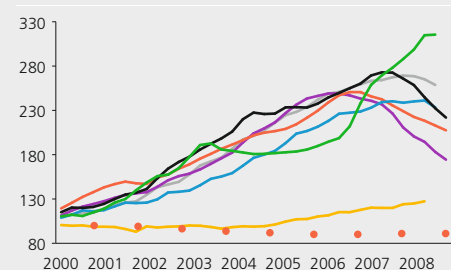
Source: BIS, CZSO, Case-Shiller (US), Nationwide (UK)

CHART III.16
Relationship between price-to-income and price-to-rent indices for various countries
(data for 2007; long-run average = 100)
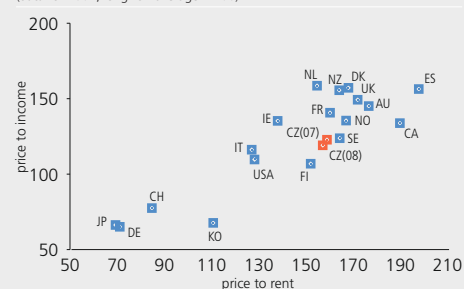
Source: CNB, CNB calculation

CHART III.17
Property prices – transfer prices and supply prices
(y-o-y indices)
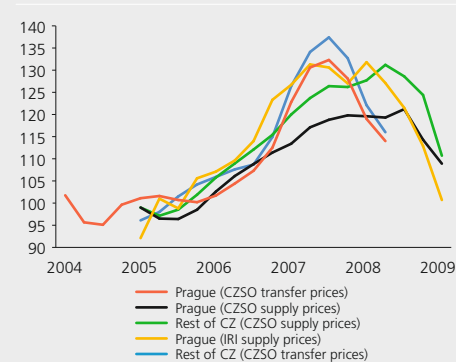
Source: CZSO, IRI

TABLE III.1
Calculated impacts of the "economic depression" scenario on apartment prices

	Change	Coefficient	Total impact in CZK/m²
Net migration	-0.69	1,729	-1,190
Unemployment rate	1.4	-350	-496
Average monthly wage	-1,502	3.4	-5,110
Loans	-2,179	0.093	-203
Total in CZK/m²			-6,998
Total in % of current price			-31.8%

Source: CNB calculation, coefficients from Estimate B in Table 3 of the thematic article *Property Price Determinants in the Czech Regions* in this Report

CHART III.18
Price-to-income ratios
(ratio of price of 68 m² apartment to wage for last 4 quarters)
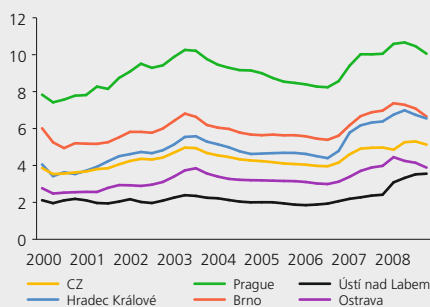
Source: CZSO, CNB calculation
Note: 2007 and 2008 data preliminary or calculated from supply prices.

CHART III.19
Rental returns
(averages for period in %; comparison with yields on 10Y government bond and house purchase loan rates)

Source: IRI, CNB

As indicated in the thematic article *Property Price Determinants in the Czech Regions* in this Report, the rapid growth in apartment prices over the past two years has been linked mainly with demand impulses such as relatively fast wage growth (of 8.5% in nominal terms and 2.1% in real terms for 2008 as a whole), declining unemployment (of 1.3 percentage points to 5% in 2008 H1 according to the MLSA[49]), record demographic characteristics[50] and continued growth in loans for house purchase. The worsening macroeconomic environment can thus be expected to lead to a decline in property prices. Table III.1 outlines a rough calculation suggesting that prices might decline by about 30% in the extreme scenario entitled "economic depression" (see section 4.1.1).[51] However, owing to the conservative behaviour of banks in the past and the relatively low LTV ratios of mortgage loans granted in the past, the impact on banks' balance sheets is relatively low even in such a relatively unlikely event.

The riskiness of the current apartment price level can also be illustrated using growth in the *price-to-income* ratio (see Chart III.18) over the past two years. Despite decreasing slightly in late 2008, the ratio is close to historical highs for most regions, which again suggests apartment prices might be overvalued relative to households' ability to repay house purchase loans from their wages. In terms of this partial indicator, Prague seems to be the riskiest region. However, Prague shows much better values than the other regions for other relevant indicators (e.g. higher net migration and lower unemployment) and will be less affected by the economic recession than other regions with large shares of industry.
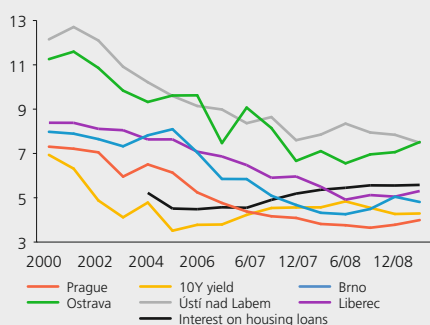
Apartment rental returns[52] improved somewhat during 2008, increasing above long-term government bond yields again for most regions (see Chart III.19). This shift seems to reflect mainly a shift in substitution between owner-occupied and rental housing, with worse access of households to house purchase loans being reflected in increased demand for rental housing. The increase in the apartment rental return might also mean that hypothetical speculative investment in property is becoming relatively more profitable. However, since apartment rental returns are still below the interest rates on house purchase loans for most regions, no expansion in speculative purchases can be expected.[53]

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49 However, unemployment increased in 2008 H2 and especially at the start of 2009, but this has not yet fed through to property prices.

50 Population growth usually results in a need for new dwellings. According to the CZSO, the population grew by 86,400 in 2008, the second-highest increase since the 1950s (behind 2007). This was due to a rise in natural population growth of 46% year on year, the highest figure since 1980, combined with the second-largest increase in migration ever recorded (immediately behind 2007). The growth in property prices was mainly linked with the increase in migration.

51 The coefficients used correspond to Estimate B in Table 3 of the thematic article. In addition to the assumptions of the "economic depression" scenario, a complete halt in migration to the Czech Republic is assumed.

52 The apartment rental return is given by the ratio of the 12-month rent to the apartment price. It is the inverse of the *price-to-rent* indicator. Unlike the *price-to-rent* indicator, however, the apartment rental return can be compared directly with interest rates.

53 Any speculative investment in property financed by mortgage loans implicitly assumes further growth in property prices.

With prices rising, housing construction saw continued fast growth at the start of 2008 (see Chart III.20). In the first three quarters of the year, the number of housing completions rose by 9.1% and the number of housing starts by 6.4% year on year, suggesting a further increase in the record values observed in 2007. However, housing construction fell sharply in Q4, with housing completions and starts declining by 30.4% and 19.1% year on year respectively. At the same time, the number of apartments under construction increased by 3%. The largest shares in the number of buildings under construction were recorded by family houses (50.6%) and apartment blocks (19%). This may indicate problems for developers, since it means they incur additional costs due to delays in selling apartments. The relatively high risk attaching to this segment of the property market, as mentioned in the 2007 Financial Stability Report, can also be illustrated by a fall in the value of developers' shares traded on the PSE.[54]

3.2.2 Commercial property prices

The above-mentioned risks to the developer sector linked with residential property are being intensified by a none-too-good situation on the commercial property market. According to information from King Sturge, almost all market segments saw a combination of record-high planned supply (growth in the total volume of planned projects, primarily for shopping centres and office buildings), driven by developers' overly optimistic expectations,[55] and a sharp fall in investor demand in 2008 (a decline in total realised investments in Chart III.21).[56] The fall in demand was due to an annual decline in the volume of transactions of about 60% to EUR 1,059 million in 2008, the lowest level since 2002. The Czech Republic mainly saw transactions in the office and retail markets in 2008.

Such a substantial decline in demand had to generate a fall in prices. The latter can be illustrated by an increase in the prime yields demanded on commercial property to roughly the 2005 level (see Chart III.22; a higher yield means that the investor demands a lower price for any given rent). While this rise in yields was in line with the growth in yields on long-term financial instruments in 2007 and 2008 H1 (the related spread narrowed), yields on commercial property increased in 2008 H2 despite a decline in government bond yields.

The slower economic growth and excess supply also resulted in an increase in the vacancy rate for both the office market (a rise from about 6% at the start of the year to 9% at the end of the year; see Chart III.23) and the logistics and industrial real estate market (an increase from 10% in January 2008 to 17.2% in 2008 Q3; the vacancy rate then fell to 15.6% in December 2008). In response to this,

CHART III.20
Housing construction
(numbers of starts, completions and dwellings under construction in given year in thousands)

Completions (left-hand scale)   Starts (left-hand scale)
Under construction (right-hand scale)
Source: CZSO

CHART III.21
Planned supply and realised demand on the commercial property market
(2006 = 100)
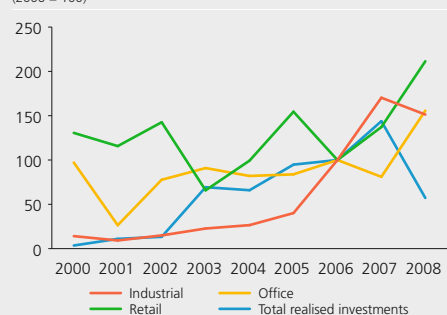
Industrial   Office
Retail   Total realised investments
Source: King Sturge
Note: Supply of industrial, retail and office property calculated from new supply in m²; realised investments from data in EUR.

CHART III.22
Yields on commercial property
(%)
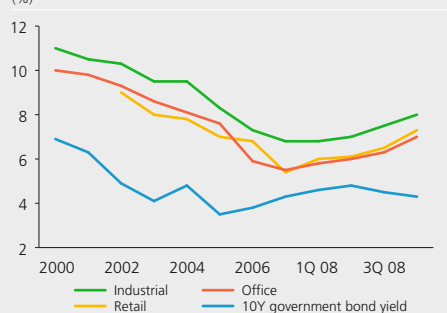
Industrial   Office
Retail   10Y government bond yield
Source: King Sturge
Note: The figures for industrial property for 2008 are only estimates (owing to an insufficient number of transactions).

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54 While ORCO's share price had been over CZK 3,500 in June 2007, it fell below CZK 100 per share in March (a slump of around 97%). Similarly, ECM's shares declined from CZK 2,000–2,050 per share in April 2007 to less than CZK 220 per share. On the other hand, developers' problems have not yet affected their ability to repay bank loans (for details see section 4).

55 On the logistics and industrial property market, for example, developers had been planning around 22 projects throughout the Czech Republic in January 2008. Of these, 13 had been completed as of December 2008.

56 Most US, UK and Irish investment funds pulled out of the Czech market in 2008 H1 and demand was maintained by German and Austrian real estate funds. However, the acquisition activities of these funds declined substantially at the start of 2009.

CHART III.23

Vacancy rate and total stock of office property
(vacancy rate in %; stock in thousands of m²)

Vacancy rate (left-hand scale)   Stock (right-hand scale)

Source: King Sturge

CHART III.24

Total value of transactions processed by SKD in individual months of 2007, 2008 and 2009 (up to 14 May)
(CZK billions)

2007   2007 average
2008   2008 average
2009   2009 average

Source: CNB
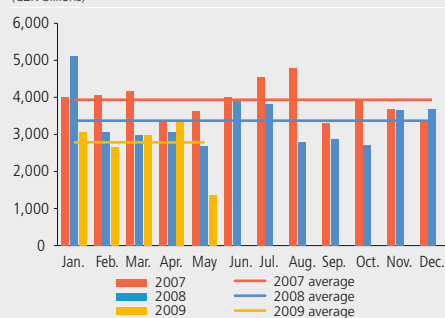
CHART III.25

Comparison of intraday credit values in 2007, 2008 and 2009 (up to 14 May)
(CZK billions)

2007 IC value   2008 IC value
2009 IC value

Source: CNB
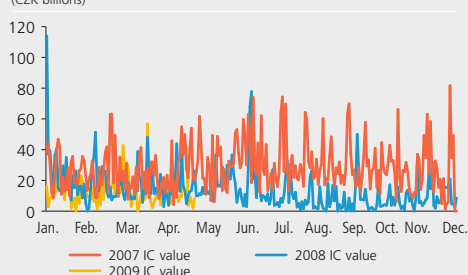
CHART III.26

CERTIS interbank payment system – number of transactions processed in 2003–2008
(CZK billions)   (millions)

Average daily turnover (left-hand scale)
Total no. of transactions in month (right-hand scale)

Source: CNB
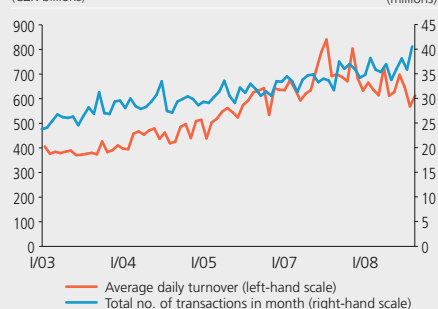
the realised supply of new offices in Prague for 2009 recorded an annual decline of 55%. In mid-2008, the logistics and industrial property market saw a virtual halt in new construction. This "freeze" can be also illustrated by the fact that no major transactions were executed in this market segment in the Czech Republic in 2008. The retail space market was a relatively stable segment, with flat demand during 2008, and was essentially capable of accepting new projects.

Developers have so far responded to the decline in demand mostly by either temporarily suspending or completely stopping project implementation. However, given the specifics of the Czech property market, where in the past developers have often made "speculative" advance purchases of land and have often not sold their projects to investors but have created their own property portfolios, such deferred implementation of projects implies significant sunk costs and additional default risks. Such risks are being reinforced by tighter bank lending conditions, for example an increase in the required contribution of own capital from approximately 10% to 30%–50% or an increase in the required pre-lease percentage (10%–15% in the past, around 30% today; 50% for industrial projects).

3.3 THE FINANCIAL INFRASTRUCTURE[57]

Financial stability continued to be supported in 2008 by the smooth operation of the interbank payment system CERTIS and the short-term bond system SKD, both of which are administered by the Czech National Bank. The high level of risk management of these two systems largely rules out the danger of them becoming a channel for the propagation of financial difficulties between institutions or markets and for generating financial instability. This risk did not materialise even during the financial crisis. The slight decline in the turnovers of these systems and the decrease in intraday credit are consistent with the developments in the financial markets. In connection with the global financial crisis, there was a one-off jump in the volume of currency in circulation in October 2008. However, it returned relatively quickly to levels in line with the long-term trend.

The value of the transactions processed by SKD[58] declined slightly in 2008, while the value of intraday credit recorded a significant decrease due to developments in the interbank market and the short-term bond market, which meant a change in the previous trend.

The value of the transactions processed by SKD rose gradually between 2000 and 2006. Having declined slightly in 2007, it recorded a further fall to around CZK 40 trillion in 2008, which represents a decline of about 6% from a year earlier (see Chart III.24). An average of CZK 159 billion was processed every day. SKD's turnover in roughly 23 days equalled annual nominal GDP. The values

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57 This section is devoted solely to the financial infrastructure systems administered by the CNB. The other components of the financial infrastructure were examined in detail in an annex to the 2004 Financial Stability Report.

58 The Short-Term Bond System (SKD) is used for issuing and registering all book-entry securities with maturities of up to one year and for settling trades in these securities. At present, T-bills and CNB bills are registered in SKD. The system enables sales of securities, repos and sell and buy operations, as well as pledges and exchanges of securities.

of the transactions in each month of 2008 were lower than a year earlier. The decline, observed since February, peaked in October, whereas the values recorded in November equalled those recorded a year earlier and the December values were slightly higher than those seen in 2007 (see Chart III.24). These figures document the situation on the Czech financial market, which saw a deterioration in the situation on the interbank market, a drying-up of liquidity in the government bond market and a decline in the volume of liquidity-withdrawing repo operations by the CNB in mid-October owing to the global financial crisis (see section 3.1).

Smooth and stable interbank settlement is supported by the use of intraday credit (see Charts III.25). Through SKD, the CNB provides CERTIS[59] participants with interest-free intraday credit to boost their cash liquidity during the day and thus ensure smooth operation of the payment system. All intraday credit extended to commercial banks by the CNB is collateralised. The volume of intraday credit had shown a gradual upward trend in previous years, but in 2008 it declined by 50% to CZK 3,590 billion. The decline in the use of intraday credit may reflect slightly lower interbank payment turnovers and a downswing on the short-term bond market. It may also indicate that banks have no problems with intraday liquidity owing to a more prudent approach to liquidity management (see Box 5) and thus have no need to use this instrument. In any case, the importance of this indicator should not be overestimated, since past experience shows that banks have often made surprisingly little use of interest-free intraday credit, despite having sufficient collateral.

CERTIS ran smoothly, with a continued upward trend in the number of payments settled and a slight fall in average daily turnover (of 7%). In 2008, CNB Clearing processed 435.6 million transactions totalling CZK 162,993 billion. This equates to a daily average of 1.72 million transactions. The average daily value of the transactions was CZK 644 billion (see Table III.2). The peak amount in a single day was 5.485 million processed transactions, which is a record. These figures reveal the extent of payment settlement in CERTIS and its significance for financial stability. It took roughly six days to reach a turnover equal to annual nominal GDP. The average daily turnovers recorded a decline compared to 2007 every month from April onwards. This represents a change in trend consistent with lower payment activity by banks (see Charts III.26 and III.27).

In October 2008, following the failure of Lehman Brothers, there was a one-off jump in the volume of currency in circulation due to corporations' and households' increased demand for cash. Although the total volume thereby increased by CZK 45.5 billion (around 16%) to CZK 399 billion at the end of 2008 (about 10.8% of GDP, see Chart III.28), the excess currency is gradually returning from circulation and the current values are in line with the long-term trend. This corresponds to the situation in the euro area, which in October 2008 saw a jump in currency in circulation of 13%, comparable to that in the Czech Republic. The ratio of currency in circulation to GDP is slightly lower in the euro area (the EUR 783 billion of currency in circulation at the end of 2008 equates to 8.5% of GDP).

CHART III.27
Average daily turnovers in CERTIS in individual months of 2007 and 2008
(CZK billions)
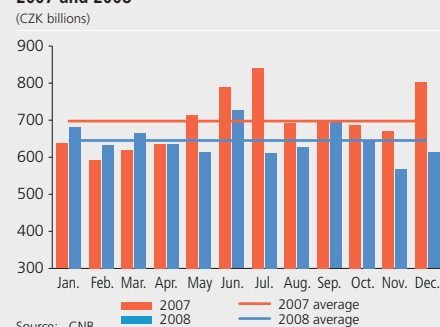
Source: CNB

TABLE III.2
CERTIS interbank payment system – statistical information

Period	Turnover (CZK billions)	Average daily turnover (CZK billions)	No. of transactions (millions)	Average daily no. of transactions (millions)	GDP/ Average daily turnover
2002	100,343	431	262	1.12	5.6
2003	96,938	385	317	1.26	6.6
2004	110,127	434	333	1.32	6.4
2005	123,354	488	356	1.40	6.0
2006	151,537	604	382	1.52	5.3
2007	174,854	697	411	1.64	5.1
2008	162,993	644	436	1.72	5.7

Source: CNB

CHART III.28
Stock and growth of currency in circulation 2000–2009
(up to 30 April 2009)

Source: CNB

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59 CERTIS (Czech Express Real Time Interbank Gross Settlement System) processes all domestic interbank transfers in Czech koruna in real time.

4 THE FINANCIAL SECTOR

CHART IV.1
Shares in financial sector assets
(%; 2008)

- Banks
- Credit unions
- Insurance companies
- Pension funds
- Investment companies, investment and mutual funds
- Leasing companies
- Other lending institutions
- Other non-bank financial corporations

75.0%
0.2%
7.5%
3.6%
3.1%
5.6%
2.5%
2.4%

Source: CNB, CZSO

CHART IV.2
Growth (fall) in shares in financial sector assets over the last two years
(change between end-2008 and end-2006, percentage points)

Source: CNB, CZSO
Note: Mutual funds include investment funds and companies; other financial corporations include investment firms, money-changing companies and other non-bank financial corporations not mentioned above.

The global financial crisis, which started in the summer 2007, escalated during 2008, resulting in the failure of several major financial institutions. The collapse of US investment bank Lehman Brothers in September 2008, which radically increased risk aversion, can be regarded as one of the peaks of the crisis in the financial system. As a result, liquidity problems occurred throughout the global financial system, including the emerging economies, which previously had not been significantly affected by the crisis. At the turn of 2009, the financial crisis entered a second phase associated with an emerging economic recession. The main risk to the global financial system going forward is an increase in non-performing loans in a situation where financial institutions enter the adverse phase of the credit cycle weakened by losses from holdings of toxic and other risky assets.

Governments and central banks responded to the build-up of losses in the global financial system with numerous measures aimed at bolstering the balance-sheet liquidity and solvency of key institutions. These measures include new liquidity-providing instruments, an easing of conditions for eligible collateral in liquidity-providing operations, increased (or unlimited) deposit insurance, capital injections, purchases of toxic assets and guarantees for bank liabilities such as bonds (see section 2.1). At the end of 2008, EU government obligations arising from guarantees of bank liabilities amounted to about 20% of GDP, while capital injections and other measures aimed at strengthening capital totalled around 5% of GDP.[60] The Czech Republic was one of the few OECD countries not forced to take any measures to strengthen the solvency of the banking sector. An increase in the deposit insurance limit thus remains the only measure implemented in the Czech Republic (except for the CNB's newly introduced liquidity-providing operations, see section 3.1).
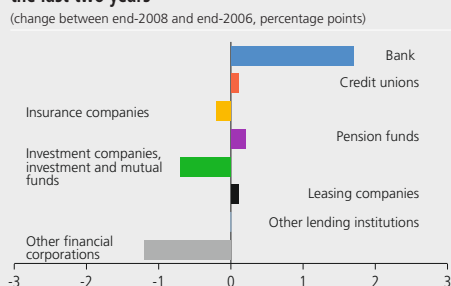
The Czech financial sector performed well during 2008, with banking and non-banking institutions maintaining relatively high profitability.[61] However, some major financial market entities saw declining profits owing to the write-off of some risky assets. The global financial crisis affected the Czech government bond market and money market (see section 3.1), but the Czech banking system recorded no major balance-sheet liquidity difficulties. Owing to the adverse price movements on asset markets over the past two years, the relative shares of the individual types of financial institutions in the Czech Republic also changed. Banks, which form the core of the financial system and which were not significantly affected by the adverse financial market developments, strengthened their position in the asset structure of the Czech financial system (see Chart IV.1). Small investors moved their funds out of mutual funds and investment portfolios managed by investment firms, which were losing value because of the falling value of assets on financial markets, and into koruna deposit accounts with banks (see Chart IV.2).

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60 See State Aid Scoreboard – Spring 2009 Update – Special Edition on State Aid Interventions in the Current Financial and Economic Crisis. European Commission, 2009.
61 The return on equity of banks, insurance companies and pension funds amounted to 21.7%, 14% and 21.9% respectively in 2008.

The Czech banking sector remains in a very good position, supported by high profitability, good balance-sheet liquidity, a high deposit-to-loan ratio, a very low (zero in the case of households) proportion of foreign currency loans and independence of external funding. Concerns about potential spillover of problems from foreign parent institutions have not been confirmed. Maybe also thanks to the standard regulatory limitations already in force before the financial crisis, liquidity was not shifted from Czech subsidiaries to foreign parent banks during the crisis. Banks and other financial institutions continue to focus on the traditional conservative business model, which has so far generated sufficient income for foreign owners on the relatively unsaturated Czech financial market. However, the lending behaviour of banks in the Czech Republic has been affected to some extent by a tightening of credit standards at the level of the global financial groups to which Czech banks belong.

4.1 FINANCIAL SECTOR DEVELOPMENTS

Although the Czech financial sector has so far weathered the impacts of the global financial crisis, the impact of the coming economic recession on banking portfolios remains a challenge. The banking sector recorded relatively high profits in 2008, amid slower growth in lending to the real economy. Hardly hit by toxic assets, insurance companies and pension fund were able to cover losses from the market revaluation of assets with their total profits and capital. However, they saw further growth in the costs of brokering new contracts, which might have negative effects on future profitability. Mutual funds suffered significant losses from the decline in asset prices, which led to a shift of part of their funds to bank deposits, where the insurance limit was increased. Like banks, leasing companies and other lending companies provided credit and loans at a slower rate.

4.1.1 The banking sector

The year 2008 was still a successful year for profitability in the banking sector. Unlike the foreign financial groups of which the major Czech banks are members, domestic banks suffered no significant losses from the revaluation of risky assets and their profits thus declined only slightly (see Chart IV.3). The banking sector generated a net profit of CZK 45.7 billion in 2008, down by just 3% compared to the record year of 2007. The relatively high return on equity (21.7%) and return on assets (1.2%) achieved in 2008 are consistent with this result. The main source of profits for most banks was growing income from financial activities (in particular, net interest income and net fee income), but asset impairment recorded an increase owing to a rise in non-performing loans.

As in the other new CEE EU Member States with predominantly foreign-owned banks, domestic banks' profits in many cases make up a large proportion of the consolidated profits of European bank groups. At the end of 2008, the worsening economic outlook in this region during 2008 H2 and the dependence of some of these economies on external funding of the credit expansion gave rise to concerns about the availability of external funds in a situation of high risk aversion. These concerns were exacerbated by depreciating national currencies

CHART IV.3
Profit in the banking sector
(CZK billions; EUR billions)

Legend: 2006 | 2007 | 2008
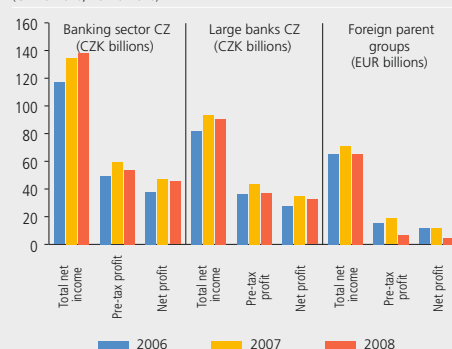
Source: CNB, published banking group results
Note: Aggregated results of Erste, KBC, UniCredit and SG groups.

CHART IV.4
Net external positions of selected EU countries' banking sectors
(in % of GDP; 2008)
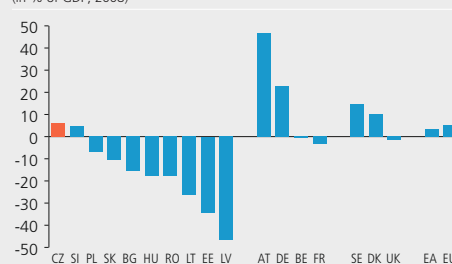
Source: IFS IMF
Note: EU is the weighted average for the EU countries, with shares in GDP used as the weights.

CHART IV.5
Gross external debt of selected EU countries' banking sectors
(in % of GDP; 2008)

Legend: Short-term external debt | Long-term external debt
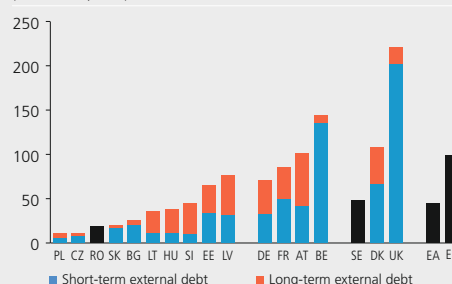
Source: BIS, IMF
Note: Maturity breakdown was not available for some EU countries; EU is the weighted average for the EU countries, with shares in GDP used as the weights.

Deposit-to-loan ratios in selected EU countries
(%; 2008; resident loans and deposits; non-bank institutions)
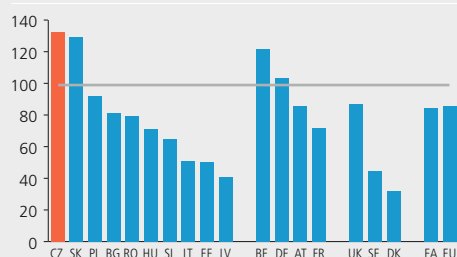
Source: ECB
Note: EA = euro area; EU = average for all EU countries.

FX loans in selected EU countries
(% of total loans to given sector; 2008)
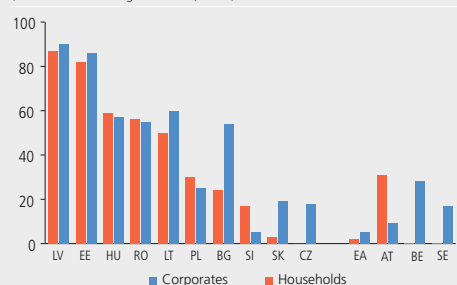
Source: BIS, ECB, national central banks
Note: EA = euro area. SI - data as of February 2008; BE - households
          include only housing loans, corporates include all client loans
          excluding housing loans.

and a high percentage of foreign currency loans in some economies, which, in conjunction with low economic growth, would result in a marked increase in non-performing loans in some CEE economies. The possibility of this adverse scenario arising was also reflected in share prices and prices of CDS contracts of bank groups with major exposures to CEE countries (see section 3.1).

Although the Czech Republic is one of the new EU Member States from the CEE region, it is already classified by international institutions and many global investment banks as an advanced economy and no longer as an emerging economy, as it does not share some of the economic and financial features of most new EU Member States.[62]

The Czech Republic and Slovenia are the only new CEE EU Member States where the banking sector is independent of external funding, despite a high share of foreign ownership of domestic banks. This is confirmed by the positive net external position of the banking sector (see Chart IV.4). The major Czech banks are thus often net creditors of the European bank groups of which they are members. Although domestic banks borrow abroad (see Chart IV.5), these external borrowings are relatively small compared to those of the other countries of the region and EU countries. The refinancing risk is also low in the Czech Republic, since the short-term net external position of the banking sector is positive and banks would be thus able to cover any shortfalls in external short-term financing by liquidating short-term external claims.

The independence of the Czech banking sector of external funding is due to the high deposit-to-loan ratio, which is high even by European standards (see Chart IV.6). Credit expansion is thus financed mainly from primary deposits. The remaining liquidity is withdrawn by the central bank in regular repo operations (see section 3.1). The excess of deposits over loans also fosters good balance-sheet liquidity of domestic banks.

A very low share of foreign currency loans is another strong point of the Czech banking system and one of the reasons why the Czech Republic avoided the liquidity problems seen in advanced markets in 2008 Q4 (see Chart IV.7). This share is virtually zero for loans to households and stood at around 18% for non-financial corporations at the end of 2008. This conservative strategy of households and corporations borrowing in the domestic currency significantly limits the dependence of banks on developments in the interbank euro or Swiss franc markets and reduces the sensitivity of debtors to depreciation of the exchange rate and changes in the interest rate environment in creditors' countries.

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62 GDP per capita in the Czech Republic expressed in purchasing power parity slightly exceeds 80% of the EU-27 average, which is higher than that in Portugal, for example. The World Bank and the IMF include the Czech Republic in the advanced countries group.

To illustrate the refinancing risks of the new CEE EU Member States, the investment community, some international institutions and respected economic media have mainly used BIS data on foreign claims for individual countries. These claims include not only direct cross-border exposures of internationally active banks in individual countries, but also whole portfolios of local claims of subsidiaries and branches of these banks in those countries.[63] Although the influence of foreign banks in the new CEE EU Member States defined in this way is relatively high, it is not significantly different from that in some other EU countries (see Chart IV.8). In many cases, however, analysts have incorrectly used the "foreign" claims defined in this way as an indicator of the dependence of domestic economic agents on external funding and have generalised the issue of refinancing to the entire CEE region. The BIS data on "foreign" claims do not take into account the sources from which the credit expansion of subsidiaries and branches of internationally active banks is financed. In the case of the Czech Republic and some other EU countries, where loans provided by foreign-owned banks are largely financed from domestic deposits, the use of the volume of "foreign" claims as an indicator of the external funding risk would imply that there is a de facto risk of a massive outflow of deposits from domestic banks' local depositors and parent banks would have to provide the missing funds from their own resources. In the first few months of 2009, the CNB came out very strongly against this very gross simplification and against the insufficient distinction being made between the countries of the region.[64]

Loan portfolio

Although growth in the banking sector's total assets continued at a slower rate in 2008 (7.9% year on year), it was still supported by a relatively high rate of growth of loans to the real sector. While the rate of growth of loans in the euro area declined to levels of around 6%, and even close to zero in the case of households at the start of 2009 (see Chart IV.9), growth in lending in the Czech Republic reached a relatively high 16.4% at the end of 2008, despite slowing appreciably (see Chart IV.10).

Annual growth in loans to non-financial corporations slowed only slightly. It stood at 14% at the end of 2008 and fluctuated around 12% on average in 2009 Q1. Part of this relatively high growth, however, was due to a rise in existing foreign currency loans as a result of the koruna depreciation.[65] In a situation of a worsening external and domestic economic outlook and falling orders, non-financial corporations showed limited demand for investment loans and loans for trade receivables. The low demand for loans has also caused month-on-month declines in total bank loans to non-financial corporations since December 2008.

63 The BIS data on foreign claims are consolidated, i.e. cross-border claims exclude loans by parent institutions to their subsidiaries and branches. The CNB used these data for the 2005 Financial Stability Report (Box 2: *Consequences of Capital Inflow and the Risk of Cross-Border Contagion*, pp. 24–25).
64 See, for example, the CNB press release of 24 February 2009 "The CNB's statement on misleading information in articles published by Financial Times and Economist", available at www.cnb.cz.
65 The growth of 13.6% year on year observed in January would have declined to 10.8% if the koruna exchange rate had not depreciated and had remained flat at the previous year's level.

CHART IV.8

Cross-border claims for selected EU countries from BIS data
(% of GDP; 2008)
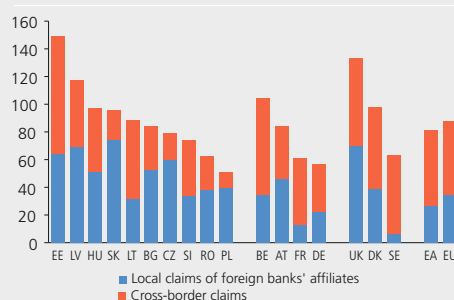
Source: BIS, IMF, Eurostat, CNB calculation
Note: Calculation based on BIS data using both available bases. The data for the EU and euro area (EA) are not consolidated.

CHART IV.9

Year-on-year credit growth in the euro area
(in %)
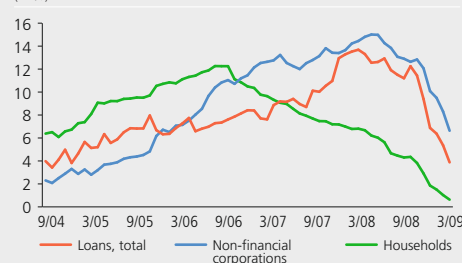
Source: ECB

CHART IV.10

Year-on-year credit growth in the Czech Republic
(in %)

Source: CNB

Non-performing loans
(% of total loans in sector; loans to residents)
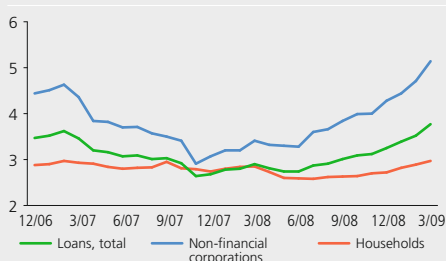
Source: CNB

Loans to non-financial corporations
(new loans y-o-y in % and rate in %)
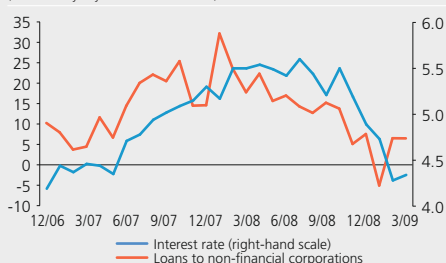
Source: CNB

Loans to households for house purchase
(new loans y-o-y in % and rate in %)
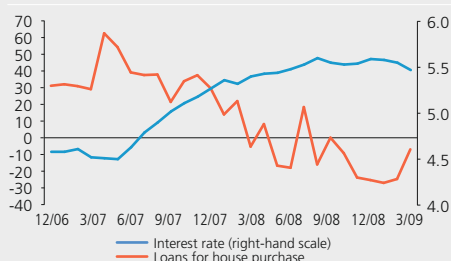
Source: CNB

In line with developments in the euro area, growth in loans to households slowed sharply, falling by 10 percentage points during 2008 to 21% in December 2008 and declining slightly further to around 19% in 2009 Q1. The growth in loans to households was driven mainly by loans for house purchase, which represent around 75% of total loans to households and which grew by 20% in 2008 (and 18% in March 2009). The growth rate of consumer credit declined in 2008, reaching around 23% in December 2008 (and around 20% in March 2009).

The adverse economic situation is negatively affecting the ability of both corporations and households to repay their obligations. The share of non-performing loans in total loans gradually increased in 2008, reaching 3.2% at the end of 2008 and 3.8% in March 2009 (see Chart IV.11). Increases were recorded both in the segment of non-financial corporations, where the NPL ratio reached 5.1% in March 2009, and in the household segment (3% in March 2009). The quality of loans to households is affected by the dominant share of less risky house purchase loans. However, this segment also saw an increase in the NPL ratio from 1.5% at the end of 2007 to 1.8% in March 2009.

Most house purchase loans are fully secured by property.[66] At the end of 2008, the loan-to-value ratio was 44% for the banking sector as a whole and 56% for banks (excluding building societies). However, an analysis of mortgage loans provided over the past three years indicates an increase in the LTV ratio for new loans to levels of around 80%–90%. These new loans with higher LTV ratios may thus become problematic in the event of default and a parallel decline in property prices (see section 4.2).

Banks have gradually been gearing up for growth in losses due to credit risk. They have long maintained the ratio of provisions to NPLs at a prudent level of around 57%. At the same time, banks in the Czech Republic tightened their lending standards for new loans throughout 2008. A lower rate of growth of new koruna loans to corporations turned into an absolute decline in new bank loans to the corporate sector at the start of 2009 (see Chart IV.12). Interest rates on loans to non-financial corporations tracked rates on the interbank market, which, however, responded to the reductions in monetary policy rates with a lag (see section 3.1), and thus declined mainly in 2008 H2. A greater tightening took place in the non-interest lending conditions, such as required collateral for projects financed and the proportion of own financing. The tightening of non-interest lending conditions was particularly apparent in the property developer sector (see section 3.2).

The volumes of new house purchase loans to households declined in absolute terms during 2008 (see Chart IV.13), and consumer credit joined this decline at the end of 2008 (see Chart IV.14). The household segment saw a more pronounced tightening of the interest rate conditions, especially for house purchase loans.

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66 The amended Act No. 190/2004 Coll. on Bonds effective from 1 July 2008 defines a mortgage loan as a loan which is at least 50% secured by a lien on property. Before this date, a mortgage loan was defined as a loan at least 100% secured by a lien on property. The latest reliable data on the share of house purchase loans fully secured (i.e. 100% or more) by property are thus available for June 2008, when this share was 65%.

While long-term rates declined during 2008 (see section 3.1), rates on new loans for house purchase with fixations of between one and five years increased by more than 50 basis points. The tightening also affected the non-interest conditions, in particular loan collateral (a lower LTV ratio) and higher household income required for a particular loan volume (i.e. a lower LTI ratio).

The negative loop between adverse macroeconomic developments, growth in NPLs and an absolute decline in lending to the economy in order to reduce risky assets, which, however, would result in a further deepening of the economic decline (a feedback effect), is identified as one of the major risks to the global banking system going forward. This might happen particularly if global economic activity declined by more than expected and the risks in banking institutions increased more substantially, to which the banks would respond with a credit crunch. Although the indicators from both the financial and the real sectors are not currently indicating this risk to a significant extent, with the exception of sharp falls in new loans in the euro area (see Chart IV.15), it cannot be ruled out in advance. In order to test the resilience of the Czech banking sector, we have thus compiled a strongly adverse alternative scenario entitled "economic depression".

Alternative scenario C: "economic depression"

Scenario C assumes a very sharp decline in domestic and external economic activity, partly due to a credit crunch in the real economy. Nevertheless, the decrease in Czech GDP would be greater than that in the euro area, amounting to -10% in 2010 Q1. The ECB would respond to the slower economic performance in the euro area by lowering rates, but the easing of monetary policy by the CNB would be limited by depreciation of the exchange rate. The significant decrease in domestic economic growth and the only slight decline in monetary policy rates would foster a marked rise in default in the non-financial corporation and household sectors, while the pro-export effect of the weaker exchange rate would be offset by a shortage of orders abroad. Overall credit growth would slow radically and turn negative in 2009 H2, while share and property prices would record a significant fall. Negative values of economic growth would exert downward pressure on the net income of the financial sector, which would amount to only 70% of the average for the last two years.

Capital adequacy, balance-sheet liquidity and the banking stability index

The Czech banking sector remains sufficiently capitalised. At the end of 2008, its capital adequacy ratio was 12.3% (12.9% in March 2009) and its Tier 1 capital adequacy was 11.8% (12.3% in March 2009; see Chart IV.16). The moderate rise in both indicators in 2008 was due to high profit generation in previous years, capital increases and gradual changeover to Basel II, which allowed capital requirements to be lowered relative to banks' credit risk thanks to more accurate risk assessment. The global financial community currently focuses mainly on the Tier 1 capital adequacy ratio, with a level of around 10% being regarded as a safe threshold. The Czech banking sector meets this requirement without any problems.

CHART IV.14
Consumer credit to households
(new loans y-o-y in % and rate in %)

Interest rate (right-hand scale)
Consumer credit
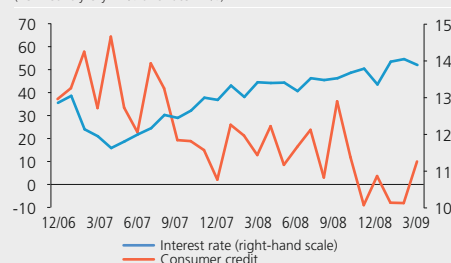
Source: CNB

CHART IV.15
New loans in the euro area
(year-on-year growth in %)

Non-financial corporations
Consumer credit to households
Loans to households for house purchase
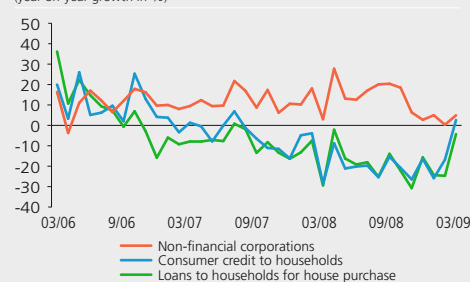
Source: ECB

CHART IV.16
Capital and capital requirements for types of banking risks
(CZK billions; %)

Capital adequacy (%, right-hand scale)
Tier 1 capital adequacy (%, right-hand scale)
Regulatory capital
Credit risk
Market risks
Operational and other risks
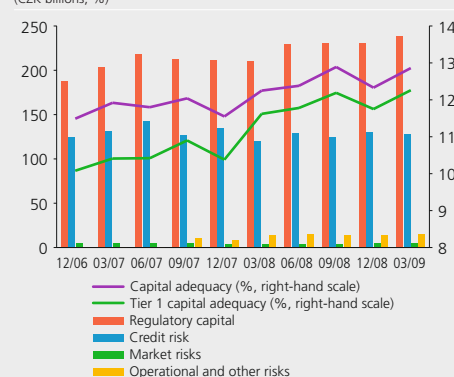
Source: CNB

Chart IV.17

Capital ratios (capital/total assets) of Czech and foreign banks

(%)

- Average for Czech banks
- Average for 10 largest EU banks
- Average for Swiss banks
- Average for 10 largest US invest. banks

Source: BankScope, CNB calculation
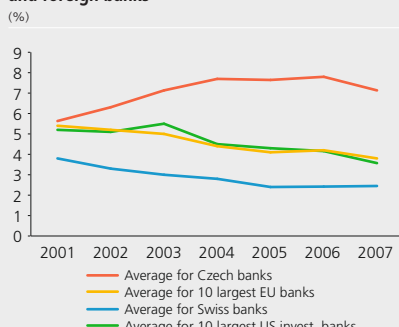
Chart IV.18

Capital ratios of major foreign banks

(%; average ratios for largest banks in country)

Source: Swiss National Bank, BankScope

Chart IV.19

Liquidity ratios in the banking sector

(%)

- Loans/deposits (client)
- Quick assets/total assets
- Liabilities payable on demand/total deposits incl. credit institutions

Source: CNB
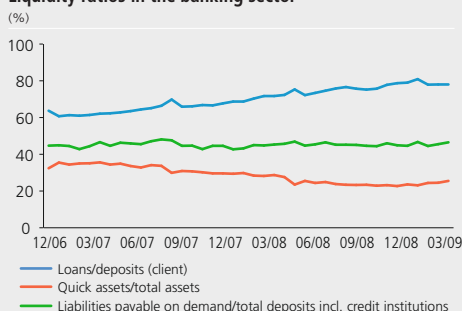
Chart IV.20

Banking stability index

(standard deviations from historical average)

- Capital adequacy (in %, right-hand scale)
- Banking stability index (left-hand scale)

Source: CNB, CNB calculation
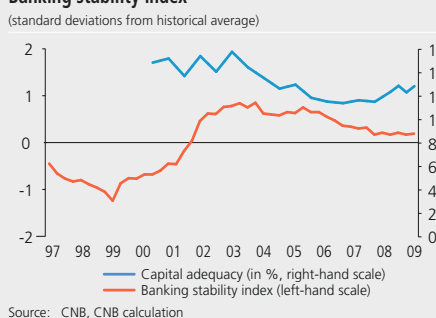
Especially in the case of small economies with rapidly growing financial sectors, it may be useful to introduce an additional regulatory threshold for the ratio of capital to (non-risk-weighted) bank assets, called the capital ratio.[67] The risk stemming from an excessively large financial sector whose assets exceed the country's GDP several times is illustrated, for example, by Iceland's experience.[68]

By comparison with foreign banks, Czech banks seem very conservative in this respect (see Chart IV.17). The average capital ratio for the largest Czech banks was 6.8% in 2007,[69] which is considerably higher than that for French, Belgian or Swiss banks.[70] While the capital ratios of foreign banks have fallen significantly since 2003, the ratio for Czech banks rose until 2006 and still exceeded 7% even after a moderate decline in 2007 (see Chart IV.18). Although this concept runs somewhat contrary to the trend of estimating risk and capital using sophisticated models that has prevailed over the last decade, it has some relevance as an additional criterion for the assessment of bank capitalisation.

The general liquidity situation in the banking sector changed little in 2008 and 2009 Q1, which means that Czech banks remain very liquid (see Chart IV.19). In March 2009, the ratio of quick assets to total assets was 25%, a level that can be deemed acceptable. The same is true of the ratio of loans to primary deposits of around 80%, which rose by 5 percentage points without having a significant effect on bank liquidity and bank business stability.

The data on banking sector soundness used to construct the banking sector stability index indicate a similar degree of stability in the Czech banking sector in 2009 Q1 as at the end of 2007 (see Chart IV.20).[71] A moderate decline in profitability, a rise in non-performing loans and slightly worse indicators of interest rate, liquidity and foreign exchange risk are offset by higher capital adequacy.

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67 Sometimes also called capitalisation. Its inverse (i.e. the ratio of total assets to capital, or assets expressed as a multiple of capital) is called the leverage ratio.

68 Some international institutions (OECD, Financial Stability Forum) are discussing the capital ratio as a complementary instrument to strengthen banks' capital adequacy and dampen the pro-cyclical effects of financial intermediation in addition to stricter existing risk-weighted capital requirements. Despite its drawbacks – above all a failure to account for risk exposures and therefore an inability to reflect structural differences in banks' business models – the capital ratio can be used as a simple and transparent, albeit rough, indicator of a bank's capital adequacy.

69 The analysis was intentionally performed on data for 2007 before banks' capital was increased under the anti-crisis measures. The capital ratio for the Czech banking sector excluding foreign bank branches averaged 8.3% in 2008.

70 The Swiss banking sector is undercapitalised judging by the capital ratio despite considerably exceeding the Basel II regulatory requirement. In 2009, therefore, the Swiss National Bank complemented regulation under Basel II by introducing obligatory monitoring of this indicator (at least 3% at group level) in response to the sector's problems.

71 The banking stability index is an aggregate indicator of the soundness of the banking sector. It is constructed as a weighted average of indicators of capital adequacy, profitability, asset quality, balance-sheet liquidity, foreign exchange risk and interest rate risk. The methodology underlying the index is described in detail in Geršl, A., Heřmánek, J. (2007): Financial Stability Indicators: Advantages and Disadvantages of Their Use in the Assessment of Financial System Stability. CNB, Financial Stability Report 2006, pp. 69–79.

Off-balance-sheet exposures of the banking sector

Since 2004, the higher rate of growth of off-balance-sheet items in relation to the domestic banking sector's balance sheet has been associated with growth in currency and interest rate derivatives and a rise in other off-balance-sheet items (see Chart IV.21). Derivatives, which account for the bulk of off-balance-sheet items (90% of off-balance-sheet assets and 75% of off-balance-sheet liabilities at the end of 2008) grew as the largest exporters gradually hedged their operations. Medium-sized and some small exporters followed suit in 2007 and 2008 in an effort to reduce the risk stemming from exchange rate volatility. A proportion of the derivatives contracts are due to interbank derivatives operations, which are used by banks primarily to manage foreign exchange and interest rate risks; another group of derivatives reflects counterdirectional hedging by domestic banks and closing out of their positions vis-à-vis foreign (parent) banks. In addition to derivatives, custody services[72] (with a share of around 13% in 2008) and pledges accepted (the remaining 12%) were also dynamically rising off-balance-sheet liability items.

The difference between the positive and negative fair values of derivatives has been positive over the last three years (see Chart IV.22). This indicates that banks are generating profit on derivatives operations regardless of the evolution of the underlying asset, e.g. the exchange rate in the case of hedging by exporters (see Box 2 *Exporters, exchange rate volatility and hedging* in section 2.2). At the same time, these developments confirm that banks usually fully close out their derivatives operations and hedge them with their parent bank or another foreign bank.

Building societies

Building societies are a relatively important part of the Czech banking sector, but their business model is limited to activities within the state-supported building savings system pursuant to a special law. The guaranteed returns on building savings foster a stable deposit base (roughly 20% of all deposits in the banking sector), enabling building societies to use funds not used for housing loans to supply liquidity on the interbank market.

The development of the building savings system depends largely on the parameters of state support, which amounted to roughly CZK 14.2 billion in 2008 and is expected to decline gradually owing to a falling number of accounts and a changeover to terms and conditions involving lower state support (see Table IV.1).[73]

CHART IV.21
Balance-sheet and off-balance-sheet of banks (stock differences)
(CZK billions)

Balance-sheet total (balance-sheet assets)
Off-balance-sheet assets
Off-balance-sheet liabilities

Source: CNB
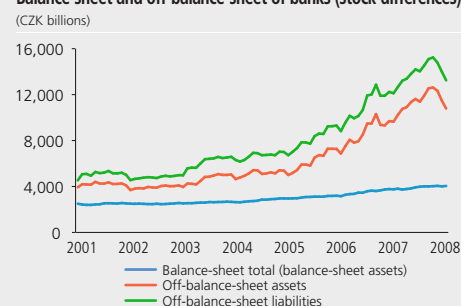
CHART IV.22
Difference between positive and negative fair values of derivatives
(CZK billions)

Non-residents
Derivatives, total
Residents

Source: CNB
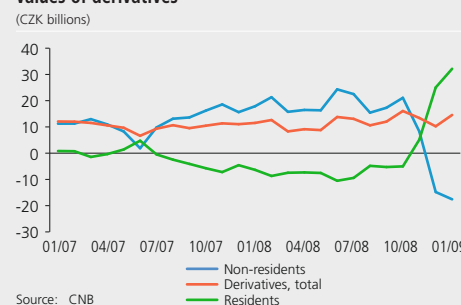
TABLE IV.1
Overview of building savings system

Situation as of 31 December 2008	No. of contracts thous.	Saved amount CZK bn	Av. interest rate on deposits % p.a.	Av. target amount CZK thous.
a) Old contracts without prolongation (until 31 Dec. 2003)	1,917	205	2.50	222
of which old contracts without state support entitlement	222	25	x	x
b) Prolonged contracts with entitlement of up to CZK 4,500	927	125	2.17	390
c) New contracts (since 1 Jan. 2004) with entitlement of up to CZK 3,000	2,207	66	1.92	279
of which new contracts without state support entitlement	68	2	x	x
Contracts total - with state support entitlement	4,760	369	2.30	278
- without state support entitlement	995	27	x	x

Source: CNB

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72 Safekeeping and administration of securities for clients – see the Glossary.
73 The accumulated state support over the entire existence of building savings schemes (since 1994) has reached CZK 136 billion.

CHART IV.23

Building society loans and deposits
(CZK billions; %)

- Loans to clients/Building society deposits (right-hand scale; %)
- Bridging loans/Total loans (right-hand scale; %)
- Standard loans/Total loans (right-hand scale; %)
- Building society loans, total (CZK billions)
- Bridging and mortgage loans (CZK billions)
- Building society deposits (CZK billions)

Source: CNB, MF CR

CHART IV.24

Life and non-life insurance (premiums written)
(CZK billions)

- Insurance, total
- Life insurance
- Non-life insurance

Source: CNB

CHART IV.25

Claim settlement costs
(CZK billions)

- Non-life insurance
- Life insurance

Source: CNB

CHART IV.26

Financial investment in assets
(% of financial investments; 2008)

- Bonds of governments, central banks, other banks and international institutions
- Other bonds, bills, deposit certificates
- Mortgage bonds and mutual fund units
- Foreign securities traded
- Shares and property
- Credit, loans and other claims
- Claims on reinsurers

Source: CNB

Building society loans represent almost 40% of all housing loans. At 27%, they grew more rapidly in 2008 than loans provided by the banking sector as a whole (20%). The growth in building society loans was due mostly to bridging loans, which to a certain extent are an alternative to bank mortgage loans. Their share in total building society loans was 80% at the end of 2008 (see Chart IV.23). Housing loans provided by building societies are characterised by very conservative LTV ratios, which averaged roughly 35% at the end of 2008.

4.1.2 Non-banking financial institutions

Insurance companies

The economic and asset market developments were also reflected in the insurance companies sector. The growth rate of premiums written moderated from 8.9% in 2007 to 5.2% in 2008, owing chiefly to a decline in the growth rate of life insurance from almost 15% in 2007 to around 5% in 2008 (see Chart IV.24). By contrast, investment life insurance recorded buoyant growth in premiums written (17.4%), unlike in the euro area, where this segment experienced lower demand as a result of the adverse financial market developments.[74] The high growth in investment life insurance in the Czech Republic was probably influenced by the fact that the financial market crisis in Central Europe and the resulting impact on investment life insurance returns did not fully emerge until the end of 2008.

The insurance sector recorded higher claim settlement costs in 2008, especially in the life insurance segment, which saw a rise of almost 22% (see Chart IV.25). This is related to a higher number of terminated and settled contracts. Some of these terminated contracts might indicate a gradual decrease in demand for investment life insurance, including a higher degree of cancellation of existing contracts, amid expectations of an economic downturn and weaker investment returns.

Return on equity decreased to 14% (from 21.7% in 2007) and average return on assets fell to 2.7% (from 3.7% in 2007). The lower profitability compared to 2007 can be attributed to asset revaluation losses. Insurance companies invest their technical provisions set aside for future claim settlements primarily in government bonds and bonds issued by banks and international institutions (53% of technical provisions at the end of 2008). Other investments were made in corporate and municipal bonds, mortgage bonds, mutual fund units, property and marketable shares (see Chart IV.26). The adverse developments on the financial markets affected virtually all types of investment, including many of the bonds in which insurance companies invest.

Insurance companies can be regarded as well capitalised, since in 2007 they were again comfortably compliant with the solvency criteria, i.e. they had internal funds greater than or equal to the required solvency ratio. The aggregate available margin was 2.7 times the required solvency margin on the life insurance market and 3.3 times that on the non-life insurance market.[75]

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74 See the ECB Financial Stability Review, June 2009.
75 Data for 2008 will become available in July 2009.
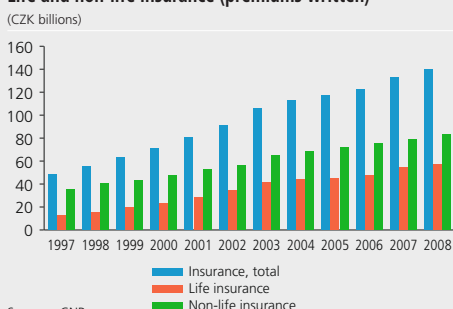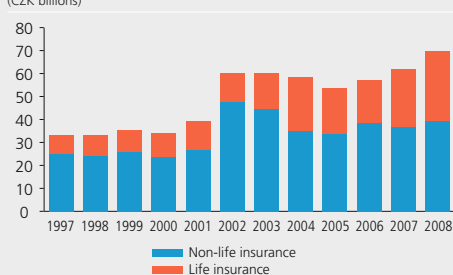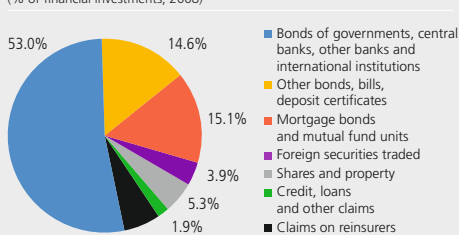
Under the quantitative impact study (QIS4), fourteen domestic insurance companies underwent calculation of the new Solvency II capital requirements last year. The insurance companies set their capital requirements according to the rules under preparation, namely the solvency capital requirement (SCR) and the minimum capital requirement (MCR). The overall results for the selected insurance companies show that their average solvency ratio fell from 335% to 235% owing to risks stemming from technical provision placement, insurance risks and other (e.g. operational) risks. As in the case of stress testing (see section 4.2), it was found that the capital requirements for market risks (interest rate and equity risks) and insurance cancellation risk were most important for life insurance, while the capital requirements for non-life insurance risk and equity risk were predominant in non-life insurance.[76]

Contract acquisition costs, which have a negative effect on insurance companies' profitability and clients' returns especially in life (investment or capital) insurance, continued to rise in 2008 (see Table IV.2).

The decline in economic activity in 2009 will affect the insurance sector to some extent. It will be reflected mainly in a fall in demand for some types of insurance (industrial insurance, vehicle accident insurance, investment life insurance) and therefore in slower growth in premiums written. This will probably result in lower profitability. As regards life insurance, the cancellations ratio may rise owing to a preference for liquidity on the part of some households. By contrast, there is increasing demand for debt insurance. However, insurance companies are acting very cautiously in this area because of the uncertainty regarding the degree of insolvency in the corporate sector. Losses can also be expected to arise due to the rise in government bond yields in the first few months of 2009 (see section 3.1) and therefore a decline in the prices of bond holdings (see section 4.2), notwithstanding the sensitivity of liabilities to interest rates, which partly dampens the impacts of interest rate changes.

Pension funds

In 2008 the pension fund sector recorded a partial decline in the rate of growth of its total assets. This was due not only to a slower inflow of new contributions credited to planholders, but also to a decrease total assets resulting from a fall in the market value of equity securities in particular. An outflow of funds also played a role, as payments of lump-sum settlement and surrender value in particular rose by 37% year on year (see Chart IV.27). The higher number of clients opting to withdraw funds may be related to a preference for liquidity among households affected by the economic downturn as well as the relatively low returns achieved by pension funds, as in the investment life insurance segment.

TABLE IV.2
Insurance contract costs paid to intermediaries (%)

	2006	2007	2008
1. Contract costs for payment in given year			
Year-on-year growth	8.4	17.9	9.0
Ratio to gross premiums on new contracts	51.9	54.5	55.9
Ratio to profit after taxation	121.2	159.8	233.7
2. Contract acquisition costs as prepayments			
Year-on-year growth	22.9	43.6	25.0
Ratio to profit after taxation	26.9	43.1	72.4
Ratio of costs (1.+2.) to annual gross premiums	17.2	19.4	20.7
Ratio of costs (1.+2.) to total costs	8.0	8.5	8.2
Coverage of total costs by annual premiums (in years)	2.2	2.3	2.5

Source: CNB

CHART IV.27
Pension fund sources and amounts disbursed in given year
(CZK billions)

- State contributions
- Planholders' contributions*
- Total contributions paid by planholders and employers
- Amounts disbursed
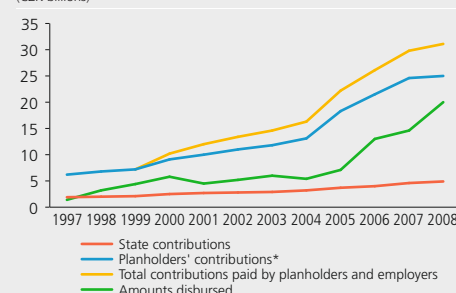
Source: CNB
Note: * Since 2005, planholders' contributions also include advances

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76 See CEIOPS' Report on its Fourth Quantitative Impact Study (QIS3) for Solvency II, CEIOPS, November 2008. The results of the study for the Czech insurance market are described in Justová, K. (2008): Studie QIS počtvrté: vyhodnocení výsledků. Pojistný obzor 4/2008.

Structure of pension fund investments
(%; 2008)

- 63.7% Bonds issued by the Czech Republic
- 3.2% Bonds of OECD member states and international institutions
- 12.0% Other bonds traded
- 7.0% Shares, units and real estate
- 8.1% Deposits on bank accounts
- 6.0% Other assets
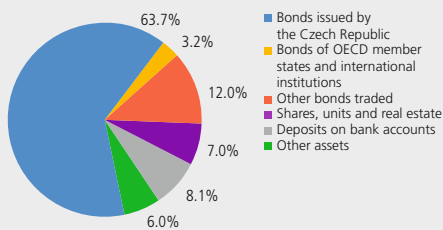
Source: CNB

TABLE IV.3
Pension scheme contract costs paid to intermediaries and effect of asset revaluation
(%)

	2006	2007	2008
1. Contract costs for payment in given year			
Year-on-year growth	20.2	30.2	28.6
Ratio to profit (loss) from financial operations	36.0	61.6	-38.5
Ratio to profit after taxation	17.4	21.2	167.2
2. Contract acquisition costs as prepayments			
Year-on-year growth	29.5	20.2	17.0
Ratio to profit after taxation	69.6	78.5	562.2
Ratio of costs (1.+2.) to annual state support	88.9	114.4	89.1
Valuation differences			
Ratio to pension funds' capital	13.3	-112.7	-249.9
Ratio to annual state support	29.9	-96.4	-166.3

Source: CNB

CHART IV.29
Equity of domestic open-ended mutual funds
(CZK billions)

- Equity
- Mixed
- Bond
- Funds of funds
- Money market
- Total
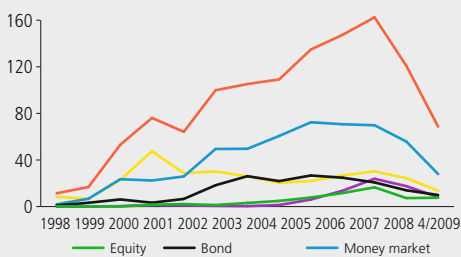
Source: AKAT CR

CHART IV.30
Net sales of units of domestic open-ended mutual funds
(CZK billions)

- Total
- Money market
- Bond
- Funds of funds
- Equity
- Mixed
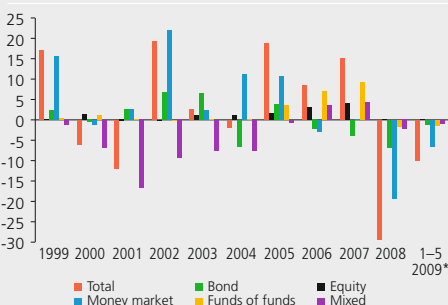
Source: AKAT CR
Note: * From 1 January 2009 to 15 May 2009.

At the end of 2008, a total of CZK 186.7 billion in contributions was registered on the accounts of private pension planholders, representing roughly 5% of GDP. This is relatively low by international comparison. In the euro area, pension funds account for 11% of GDP on average, but it must be taken into consideration that systems differ considerably across countries with regard to support and volume.

Under the limits set by law, pension funds invest the funds they raise from planholders in relatively safe assets. In 2008, 87% of assets were invested in bonds issued by general government, bank deposits and other bonds (see Chart IV.28). Investments in shares and units, which can be more volatile than bonds, attracted 6.2% of funds. However, investments in shares and mutual fund units were unfavourable in terms of profit generation. In 2008, funds lost tens of per cent on financial investments in shares and units.[77] Further losses resulted from unhedged or only partially hedged currency exposures. Losses (valuation changes) in the sum of the revalued assets, liabilities and hedging derivatives of pension funds increased from CZK 4.4 billion in 2007 to CZK 8.2 billion in 2008.

In 2008, shareholders increased the capital of pension funds by CZK 6.5 billion. This improved the conditions for fund stability and compensation of asset revaluation losses. Nevertheless, it is expected that shareholders will increase the capital further in 2009. The adverse developments on asset markets – especially bond markets – in 2009 Q1 increased the unrealised losses of pension funds by roughly another CZK 6 billion. Although these losses may be reversed by a decline in long-term bond yields after the high risk aversion decreases, pension funds are required to have sufficient capital to cover asset market volatility so that they do not encounter a negative equity situation (see section 4.2).

In addition to asset revaluation losses, rising contract acquisition costs on the part of intermediaries, which reach about 90% of state support payments every year, could also have a negative impact on the system and its profit generation (see Table IV.3).

Investment companies and mutual funds

As a result of the adverse financial market developments, the position of domestic mutual funds deteriorated significantly compared to the previous year (see Chart IV.29). The equity of domestic open-ended mutual funds had totalled almost CZK 162 billion at the end of 2007, but by the end of April 2009 it had fallen by CZK 93 billion to CZK 69 billion. Large decreases were recorded not only by equity and bond funds, but also by relatively safe funds such as money market funds.

The decrease in the equity of funds was driven by a fall in market prices of assets and an outflow of money and a transfer of investments to safer and more liquid instruments, such as bank deposits (see section 4.1). In 2008, the total value of units redeemed by mutual funds exceeded the overall value of units sold by CZK 29 billion, which represents a major turnaround compared to 2007 (see Chart IV.30).

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77 The fair value of their share holdings was roughly 50% below the acquisition price at the end of 2008; in the case of mutual funds the decline was more than 30%.

The highest redemptions were recorded for money market funds (almost CZK 20 billion). Net sales persisted in the first few months of 2009 Q1, reaching almost CZK 10 billion.[78]

Households are the main investors in mutual funds; their share in all units held by residents exceeded 60% in 2008. However, the decline in returns on mutual fund units does not represent any major risk, as this instrument accounts for only 5% of the total financial assets of households.

Non-bank investment firms

Like other financial institutions, non-bank investment firms have been hit by the financial crisis.[79] Together with a rise in market risk, the increased volatility on the asset market and the rapid decline in asset prices (see section 3.1) led to a fall in demand for investment intermediation among smaller clients, who trade chiefly using credit from investment firms and account for nearly 40% of all clients (see Chart IV.31).

Loans provided to non-financial clients for securities purchases fell by almost 60% compared to 2007. This decline was driven by the drop in stock prices, weaker demand for purchasing securities on credit and a lower supply of this type of trade by investment firms. This was because of an overall decline in loans to investment firms (mainly from banks) connected with increased balance-sheet liquidity risk.

Total client assets managed exceeded CZK 10 billion (less than 1% of GDP) in 2008. This financial sector does not present any significant risk to the financial system as a whole. In the case of households, which use investment firms for individual investment in securities, the ratio of bonds and marketable shares to total financial assets is only 2%, while the same indicator for the euro area is around 10%.

Non-bank financial corporations engaged in lending

The uncertainty regarding economic activity in the Czech Republic also affected non-bank financial corporations engaged in lending. The volume of assets financed through leasing companies, other lending companies and factoring and forfaiting companies had risen by around 20% in the previous period, but the situation deteriorated significantly last year (see Table IV.4).

CZK 242 billion was lent in leasing last year, an annual increase of only 5.6%, which is very low compared to the growth in total bank loans (16.4%), which are a competing source of funding. In addition to weaker economic activity,

CHART IV.31
Structure of clients by volume of transactions arranged in 2008
(%)

- 22.11% — Banks
- 25.56% — Institutional investors
- 0.95% — Credit unions
- 14.88% — Dealers (non-banks)
- 36.5% — Others

Source: CNB
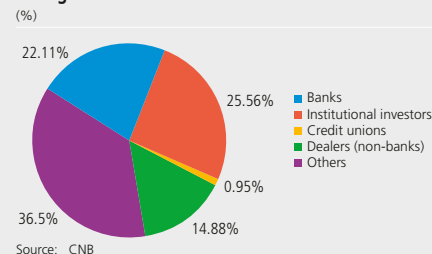
TABLE IV.4
Activities of leasing companies, other lending companies and factoring and forfaiting companies
(CZK billions; year-on-year change in %)

	2006	2007	2008	y-o-y change 07/08
Leasing companies				
Loans, total	192.0	229.6	242.4	5.6
Loans to non-financial corporations	131.2	146.9	168.2	14.5
Loans to households	57.3	78.8	69.6	-11.7
Other lending companies				
Loans, total	63.9	78.6	88.9	13.1
Loans to non-financial corporations	3.3	4.7	5.7	21.3
Loans to households	57.5	70.2	81.7	16.4
Factoring and forfaiting companies				
Loans to non-financial corporations	16.9	22.0	19.1	-13.2

Source: CNB

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78 A similar trend, i.e. a decline in the market prices of individual mutual fund units and an outflow of investments from mutual funds, was also recorded by foreign open-ended mutual funds, in which Czech residents also invest.

79 Nine non-bank investment firms are members of the Prague Stock Exchange and their trading volume in 2008 was CZK 1,224 billion in shares and CZK 1 billion in bonds. By comparison with 2007, this represents a decline of 16% in share trading and 65% in bond trading.

the decline in demand for lease financing on the part of households was due to changes in the taxation of financial leasing last year, including the accelerated signing of financial leasing contracts in 2007 before these changes took effect. This decline notwithstanding, the share of leasing to GDP is around 6.5%, which is not significantly different from the European average (for the EU-27, this share was around 5.7% in 2007).[80]

Source: CNB calculation
Note: Points further from the centre of the chart signifies more risk, tighter conditions or more vulnerable sector.
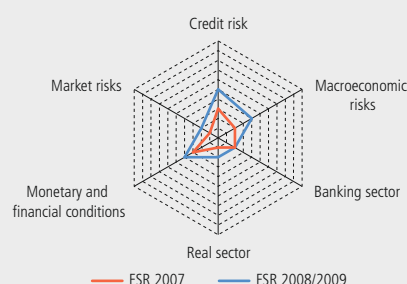
Box 7: Financial stability map

A financial stability map is one way of aggregating information on the financial stability of the Czech economy.[81] It shows a combination of the key risks to financial stability, the monetary and financial conditions and the situation (resilience) of the financial and real sectors.

The financial stability map for the Czech Republic contains six composite indicators, of which three capture risks (macroeconomic, credit and market risks), one captures the monetary and financial conditions and the remaining two capture the vulnerability of the real and financial sectors. The indicators are normalised on a scale from 1 to 10, with higher values representing higher risk, tighter conditions and greater vulnerability (lower resilience).

The composite indicators were constructed as follows. The indicator of macroeconomic risks is the average of the GDP growth forecasts for next year in the euro area and the Czech Republic and the risk premia (CDS spreads) for Central European countries. The credit risk indicator is composed using the current and expected rates of loan delinquency for households and corporations, while the market risk indicator is based on a volatility index, an index of market liquidity for the Czech financial markets and the expected volatility of short-term interest rates and the exchange rate.

The indicator of the financial sector's vulnerability uses the banking stability index and the results of standardised stress tests of banks, while the indicator of the real sector's vulnerability contains a number of indicators concerning the debt of individual real sectors and the economy as a whole, as well as an indicator of the creditworthiness of the corporate sector. The monetary and financial conditions are calculated as the average of the risk premium in the Czech Republic, bank interest rates for the real sector, current and expected growth in new loans to the real sector and expected exchange rate movements at the one-year horizon. The map is constructed as of the first quarter of the given year and contains the indicators of past developments available at that time and also some forward-looking indicators capturing the risks for the period ahead.

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80 For comparison, this share is 11% in Hungary and around 3% in Poland, and in Germany it is about the same as in the Czech Republic (roughly 6%).

81 For a discussion of the efforts to compile aggregate financial stability indicators and construct an experimental banking stability indicator for the Czech Republic see Geršl, A., Heřmánek, J.: Financial Stability Indicators: Advantages and Disadvantages of Their Use in the Assessment of Financial System Stability. Financial Stability Report 2006, CNB.

The financial stability map for the Czech Republic indicates that the risks are rising significantly compared to the previous year, especially the macroeconomic and credit risks (see Chart IV.1 Box). The resilience of the real sector is falling slightly owing to the economic recession, and the monetary and financial conditions are generally tighter. This is the case despite the easing of monetary policy and the depreciation of the exchange rate, mainly as a result of increases in risk premia and client interest rates and a decline in the rates of growth of lending to the real sector. However, the banking sector remains resilient to a similar extent as in the previous year. This creates good conditions for absorption of the risks stemming from the expected adverse macroeconomic developments.

4.2 ASSESSMENT OF THE FINANCIAL SECTOR'S RESILIENCE

According to stress tests using alternative macroeconomic scenarios, the financial sector is resilient to market, credit and some other risks. However, some financial institutions would suffer losses which might require capital injections if the alternative scenarios materialised. The longer the horizon of the negative economic situation, the higher the losses and the lower the level of capital adequacy that can be expected.

This section sets out to assess the resilience of the Czech financial sector. This is done using stress tests quantifying the impacts of various shocks on financial institutions. In the stress testing, we analyse the effects of alternative model-consistent scenarios. This section also presents the results of a new stress test of the banking sector's liquidity.

Three alternative scenarios were presented in the 2007 Financial Stability Report (safe haven, property market crisis and loss of confidence). Subsequent economic developments showed that the risks captured in two of these three scenarios materialised. Until September 2008, the Czech economy evolved broadly in line with the "safe haven" scenario, characterised by a very strong koruna and a gradual slowdown in GDP growth due to a greater-than-expected decline in external demand. This scenario was not expected to have major effects the soundness of the financial sector, and reality confirmed this. 2008 Q3 saw a turnaround and the outcomes were closer to the "loss of confidence" scenario, with a significant cooling of economic activity and gradual depreciation of the koruna. In the stress test, this scenario generated higher risks to the financial sector, related largely to expectations of large interest rate increases in response to the inflationary pressures stemming from the weaker koruna. In reality, however, these risks were dampened because the CNB cut its monetary policy rates as the inflationary pressures subsided and market rates also declined as a consequence. At the same time, bank capital was strengthened in 2008, so capital adequacy increased compared to the end of 2007.

CHART IV.32
Alternative scenarios: real GDP growth path
(%)

Europe in recession
Market nervousness
Economic depression
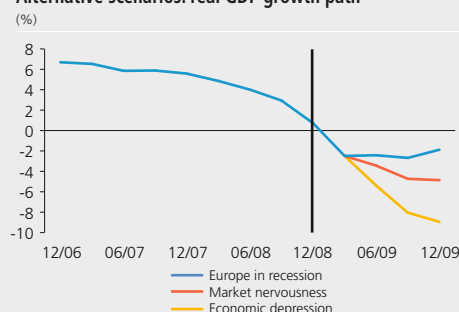
CHART IV.33
Alternative scenarios: 3M PRIBOR path
(%)

Europe in recession
Market nervousness
Economic depression
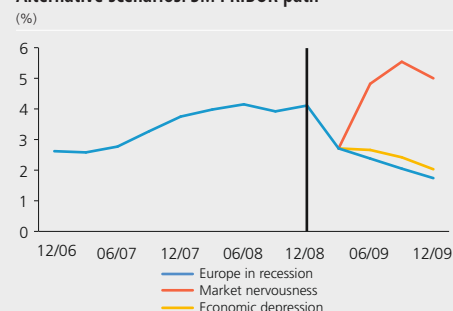
CHART IV.34
Alternative scenarios: exchange rate path
(CZK/EUR)

Europe in recession
Market nervousness
Economic depression
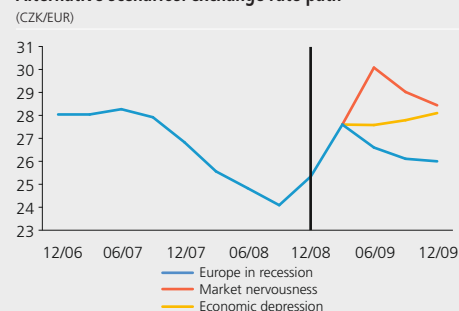
Alternative scenarios: inflation path
(%)

Scenario type and shock size in bank stress test

Scenario type	Europe in recession	Market nervousness	Economic depression
Change in CZK interest rates (p.p.)	-1.86	0.32	-1.65
Change in EUR interest rates (p.p.)	-2.92	-3.82	-3.63
Change in CZK/EUR exchange rate (- appreciation, %)	4.86	13.58	9.57
Loan default rate of households (%)	5.43	6.35	7.85
Loan default rate of corporations (%)	13.04	13.48	16.98
Growth in loans to households (%)	0.76	-0.68	-4.44
Growth in loans to corporations (%)	-5.38	-6.74	-10.29
Net income compared to 2007-2008 average (%)	90	80	70

Source: CNB
Note: Changes in parameters represent the difference between 2008 Q4 and the average for 2009.

As in the 2007 Financial Stability Report, three alternative adverse scenarios were presented in the preceding text, this time entitled "Europe in recession" (scenario A), "market nervousness" (scenario B) and "economic depression" (scenario C).[82] The alternative scenarios respond to risks identified in the domestic real and financial sectors and abroad and represent the potential unfavourable evolution of the current global economic recession.[83]

All the scenarios were defined primarily using key economic variables, in particular GDP (see Chart IV.32), short-term interest rates (see Chart IV.33), the exchange rate (see Chart IV.34) and inflation (see Chart IV.35), and were constructed in a model-consistent way using the CNB's prediction model.[84] The average predictions for the macroeconomic variables in 2009 are entered in the stress tests which have a one-year shock impact horizon. The other parameters entering the stress tests were derived using the values of the aforementioned macroeconomic variables with the aid of sub-models (see Table IV.5). In the case of the stress tests for insurance companies and pension funds, some shocks (e.g. the specific shock in the insurance sector) were specified using expert estimates based on historical averages or foreign experience.[85] We also assume that all financial institutions will generate positive net income (for banks especially net interest income and net fee income) and will use it as first line of defence against the shocks. Net income is set separately for each scenario as a percentage of the average for the previous two years, depending on the evolution of economic activity (see Table IV.5).

Scenario B ("market nervousness") can be classified as the worst, with an aggregated impact on all three tested financial sector segments (banks, insurance companies and pension funds) of almost CZK 110 billion. Underlying this impact is a combination of significant losses due to the credit risk of banks and losses from a decline in prices of assets (shares and bonds) in other financial institutions. The impacts of the other scenarios are smaller (CZK 47 billion for scenario A and CZK 86 billion for scenario C), as they assume a decline in interest rates and therefore a rise in prices of bond holdings, which reduces the other losses.

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82 The "Europe in recession" scenario is the CNB's official May 2009 macroeconomic forecast as described in detail in Inflation Report II/2009.

83 Comparison with the results in the 2007 Financial Stability Report is not possible, as in the meantime substantial changes have been made to the models used and to the tests themselves. These changes were made as a consequence of backtesting of the models and tests on real data from previous years, which showed that the stress tests overestimated the risks. Although overestimation of risks is a more acceptable form of deviation than underestimation from the point of view of financial stability, the models used and their assumptions had to be put on a more realistic footing. In particular, the models for loan growth and credit risk and the assumptions about the outflow of non-performing loans were adjusted and more realistic assumptions about the degree and allocation of the banking sector's net income were incorporated.

84 This is the CNB's official "g3" macroeconomic prediction model, whose main features were presented in Inflation Report II/2009.

85 The methodology of the stress tests for banks, insurance companies and pension funds was described in detail in previous Financial Stability Reports.

Stress test results for the banking sector

The banking sector as a whole would withstand the shocks in all three alternative scenarios, although there are banks that would not be compliant with the regulatory capital adequacy threshold in each scenario. The total effects of the shocks in scenario A ("Europe in recession") would be around CZK 60 billion (roughly 25% of the banks' capital, or 125% of the average annual profit in the last five years). These losses are due to the relatively large credit shock, but the decline in interest rates has a favourable impact. However, we assume that banks will generate net income (especially net interest income and net fee income) of 90% of the 2007–2008 average, which they will use to cover their losses. A few smaller banks would fail to comply with the capital adequacy requirement under this scenario, requiring a capital injection of 0.2% of GDP (around CZK 8 billion). However, the banking sector as a whole would withstand the shocks with a resultant capital adequacy ratio of 11.3% despite an increase in the NPL ratio from 3.5% at the end of 2008 to almost 8% at the end of 2009 (see Chart IV.36). As scenario A represents the most probable outcome, these losses can be interpreted as the upper estimate of expected losses in 2009, as the stress tests usually overestimate the risks.

In the case of scenario B ("market nervousness"), which simulates a combination of a decline in economic activity and a sharper depreciation of the koruna, therefore being rather similar to last year's "loss of confidence" scenario, the overall impact of the shocks would be almost CZK 100 billion (roughly 45% of the banks' capital, or 210% of the average annual profit in the last five years). A moderate average increase in interest rates occurs in this scenario, but its impact is very small. We assume that banks would generate net income of only 80% of the average for the previous two years. In this scenario, the number of banks that would fail to comply with the capital adequacy requirement would be twice the number under the "Europe in recession" scenario and would include some more important banks. Capital injections would require around 0.4% of GDP (CZK 15 billion). The banking sector would withstand this scenario, too, with an overall post-test capital adequacy ratio of 10.0% and an NPL ratio rising to 8.6%.

The total effects of the shocks under scenario C ("economic depression") would be around CZK 90 billion (roughly 40% of the banks' capital, or 200% of the average annual profit in the last five years). These effects are due almost exclusively to the credit shock resulting from a decrease in GDP growth to high negative figures, while the slight decline in interest rates and moderate exchange rate depreciation have a positive effect. The lower impact than in scenario B ("market nervousness") is due mainly to the positive effect of very low interest rates. We assume that banks' net interest income and net fee income would be only 70% of the average for 2007–2008. A few smaller banks sensitive to credit risk would fail to comply with the capital adequacy requirement under this scenario. Stabilising them would require a capital injection of 0.4% of GDP (around CZK 15 billion). Even in this scenario, however, the banking sector as a whole would withstand the shocks with a resultant capital adequacy ratio of 9.7%, despite a significant rise in the NPL ratio to 11.2% at the end of 2009.

The stress tests results are not very sensitive to the assumptions regarding net income generation. For example, in the worst scenario ("economic depression") net income would have to fall to just 15% of the average for the previous two years to bring the capital adequacy of the entire sector down to the regulatory

TABLE IV.6
Results of bank stress tests

Scenario type	Europe in recession	Market nervousness	Economic depression
Key macroeconomic variables in 2009			
Real GDP growth (%, y-o-y)	-2.4	-3.9	-6.2
Inflation rate (%, y-o-y)	1.2	1.7	1.3
1Y PRIBOR (%)	2.4	4.6	2.6
CZK/EUR exchange rate	26.6	28.8	27.8
Capital adequacy (CAR)[1]	*12.3*	*12.3*	*12.3*
Overall impact of shocks (p.p. CAR)	-3.2	-5.4	-5.0
Interest rate shock	1.3	0.0	1.2
Exchange rate shock	0.0	0.1	0.1
Credit shock	-4.4	-5.4	-6.2
... *households*	-1.3	-1.5	-1.8
... *non-financial corporations*	-3.0	-3.1	-3.9
Interbank contagion	-0.1	-0.1	-0.1
Income allocation[2]	2.2	3.1	2.4
Post-test CAR	*11.3*	*10.0*	*9.7*
Capital injection (CZK billions)[3]	8.0	15.7	15.5
Capital injection (% of GDP)[3]	0.2	0.4	0.4
No. of banks with CAR below 8%	4	8	4
Share of banks with CAR below 8%[4]	8.2	21.8	5.0
No. of banks with negative capital	0	0	1
Share of banks with negative capital[5]	0.0	0.0	5.2

1) CAR means the capital adequacy ratio defined in accordance with the relevant CNB regulations, in particular the prudential business rules.
2) We assume that even given adverse developments banks would generate income that would use to strengthen their capital. We estimated the level of income on the basis of past trends and the parameters of the adverse scenario. When allocating income, each bank tries to attain its initial CAR.
3) The capital needed to ensure that each bank has a post-shock CAR of at least 8%.
4) The share of banks with a post-shock CAR of 0%–8% (as a percentage of total assets).
5) The share of banks with negative post-shock capital (as a percentage of total assets).

CHART IV.36
Results of macro stress test scenarios for banks

Europe in recession
Market nervousness
Economic depression
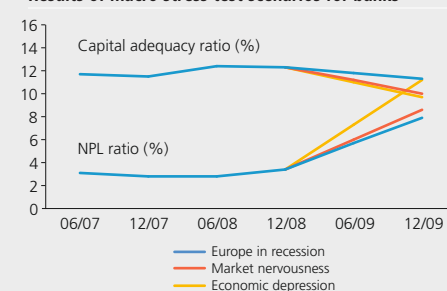
minimum of 8%. Such a low level of income is not very probable, as in previous periods of crisis banks have experienced transfers of funds from riskier investments to (low-interest) demand bank deposits, which has boosted their ability to generate sufficient interest and non-interest income.

As regards the results of stress tests for banks, it must be borne in mind that the shock impacts are calculated for the one-year horizon. As credit risk usually materialises gradually and with a lag behind the business cycle, the rates of default and the NPL ratio may continue rising in 2010. This is indicated by the results of new dynamic stress tests performed for the aforementioned alternative scenarios (see Box 8).

CHART IV.2 (BOX)
Capital adequacy ratio path in dynamic stress tests of banks
(%)

Europe in recession
Market nervousness
Economic depression
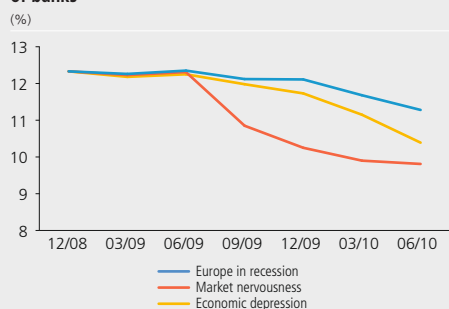
CHART IV.3 (BOX)
Non-performing loan ratio path in dynamic stress tests of banks
(%)

Europe in recession
Market nervousness
Economic depression
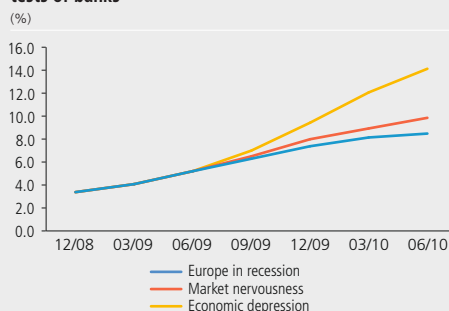
Box 8: Dynamic stress tests for banks

The current stress test methodology used by the CNB and other national and international institutions to test the resilience of the financial sector is limited as regards its ability to capture the effects of individual shocks over time and their potential interaction with the macroeconomic environment (feedback effect). This can be best illustrated by the difference between the effects of market and credit risks. While the impact of a change in interest rates or other market variables (the exchange rate or stock prices) on the balance sheets of financial institutions is virtually immediate (revaluation of securities), credit risk accumulates over a longer time frame (one to three years) as loans gradually shift into the NPL category. The standard stress tests address this discrepancy with a compromise assuming an impact horizon of one year. However, the global credit crisis and the onset of the economic recession worldwide show that this compromise is imperfect. Market shocks have paralysed financial institutions within a few days, yet NPL losses will accumulate gradually over the course of more than a year.

One of the possible solutions to these disadvantages is to switch to a form of "modelling" of the financial or banking sector. Banks' balance sheets would be modelled dynamically, for example for each quarter, as they are hit by the individual shocks. This would allow the shock impact horizon to be extended, for example to six to eight quarters. Losses would then accumulate gradually and if any of the key variables (e.g. the capital adequacy ratio) overstepped a pre-defined threshold during the whole cycle, other shocks would be generated (e.g. interbank contagion, outflow of liquidity, etc.). However, choosing the best possible way of modelling banks' behaviour amid slowly accumulating losses remains a challenge in this approach.

This box presents the first attempt at dynamic stress testing of banks in the Czech Republic, using the alternative scenarios prepared for the standard stress tests. The results show that capital adequacy falls further compared to the standard test as the horizon is extended to six quarters (see Chart IV.2 Box). This is due chiefly to further growth in credit risk, which peaks in the first two quarters of 2010 (see Chart IV.3 Box). The tests, however,

work with the extremely conservative assumption that banks do not respond to the impacts of the shocks. That is why the results are unrealistically pessimistic.

Dynamic tests also allow us to identify the different contributions of the individual shocks over time. This is best seen in the case of scenario B, which assumes losses due to unfavourable interest rate changes in some quarters, but these losses are fully reversed in the following periods and a positive accumulated impact of the interest rate changes prevails in 2010 Q2 (see Chart IV.4 Box). It is these dynamics of the directional changes in the shocks over time that can generate stress situations in the financial sector even over a longer impact horizon and that cannot be captured by the standard stress tests using averages for the entire test period.

CHART IV.4 (BOX)
Accumulation of shocks in dynamic stress tests of banks for scenario B "market nervousness"
(p.p. CAR)

Credit shock — Overall impact of shocks
Exchange rate shock — Interest rate shock

Note: The chart shows the accumulated impact of the shocks not taking into account net income and any capital increases during the test period.

The onset of the economic recession has increased the uncertainty regarding growth in the NPL ratio owing to the decline in household income (see section 2.3) and movements in house prices. The combination of a high NPL ratio for housing loans and a decrease in property prices (see section 3.2) could have a significant impact on the banking sector.

In a sensitivity stress test on the housing loan portfolio, we assume that new non-performing housing loans have an LTV ratio of 100%. That is a radical assumption, as the average LTV ratios in individual banks range from 35% to 100%. On the other hand, this assumption is in line with the findings that many mortgage loans were provided with an average LTV of 80–90% over the last two years (see section 4.1). The analysis assumes that an increase in the share of non-performing housing loans would be accompanied by an equal decline in property prices. Problem debtors or banks themselves could cause a more marked decline in property prices by selling larger volumes of collateral on the property market.

The simple test demonstrated the banking sector's resilience to a mortgage loan portfolio shock given the above-mentioned radical assumptions. With regard to provisions created and capital adequacy, banks should withstand the stress of an increase in non-performing mortgage loans of as much as 25% if they could not sell any collateral. If collateral was sold at a property value loss of around 25%, the capital adequacy ratio would fall only slightly (see Chart IV.37).

One of the risks that might arise if the highly adverse scenarios B and C materialise is a panic on domestic financial markets. This might happen if some banks fall below the regulatory threshold for capital adequacy. The panic would then be reflected not only in interbank contagion, which is taken into account in the stress tests, but also in bank runs and problems in asset markets. This balance-sheet liquidity risk is tested using an advanced approach in Box 9.

Drawing on the experience of countries that have rescue plans in place for banking sectors hit by severe losses, the CNB and the Ministry of Finance prepared a preventive amendment to the Act on Banks which expands the powers of the CNB as the financial market regulator and supervisor. For example, the amendment simplifies the process of increasing a bank's capital and enables the central bank
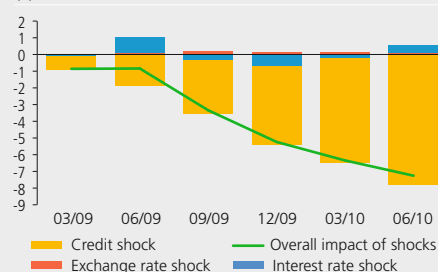
CHART IV.37
Simple test for mortgage loans
(%, 2008)

Growth of non-performing mortgage loans and decline in property prices

Pre-shock CAR
CAR after housing loan shock
CAR after credit shock and sale of collateral at a loss
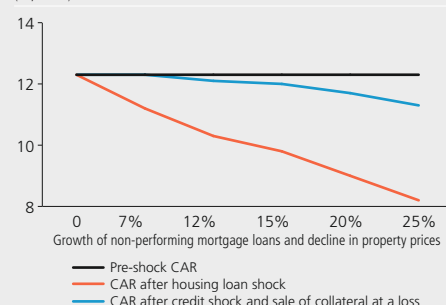
Source: CNB
Note: Scenarios of additional 7–25% of mortgage loans becoming NPLs. Banks or clients would sell collateral at 93–75% of its value.

Fig. IV.1 (Box)
Flow chart for liquidity stress test

Liquidity buffer (B_0) $\Rightarrow$ Scenario $\Rightarrow$ 1st round effects $\Rightarrow$ Liquidity buffer (B_1)
$\Downarrow$
Threshold
$\Downarrow$
Liquidity buffer (B_2) $\Leftarrow$ Mitigate shock $\Leftarrow$ Reactions by bank
$\Downarrow$
Reputational risk
$\Downarrow$
Collective behaviour
$\Downarrow$
Liquidity buffer (B_3) $\Leftarrow$ 2nd round effects
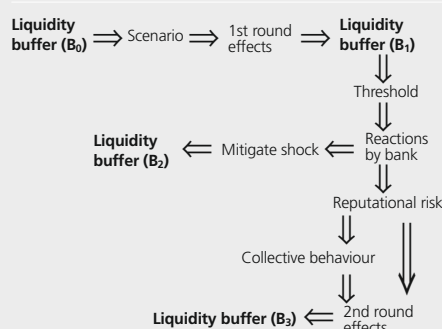
Source: Van den End, J. W. (2008): Liquidity Stress-Tester: A Macro Model for Stress-testing Banks' Liquidity Risk, DNB WP No. 175, May 2008

Table IV.1 (Box)
Summary of liquidity stress test results
(CZK billions)

	Total	Weighted average
Initial buffer (B_0)	3,902	388.6
Buffer after 1st round (B_1)	2,382	229.5
No. of banks reacting	14	14
Buffer after banks react (B_2)	2,998	302.7
Buffer after 2nd round (B_3)	2,041	202.7

Source: CNB
Note: Banks' total assets used as weight for average.

Chart IV.5 (Box)
Change in banks' liquidity buffer
(%)
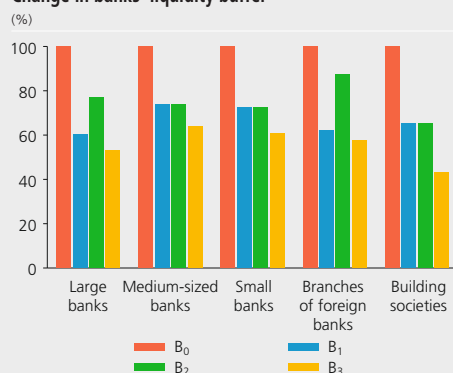
Source: CNB
Note: B = size of buffer, B_0 = before shock, B_1 = after 1st round, B_2 = after banks react to 1st round, B_3 = after 2nd round.

to respond more flexibly to banks' problems using numerous new instruments (e.g. the rapid transfer of a troubled bank to a sound institution or a special-purpose public bank). The CNB is thus preparing preventively for the relatively unlikely but possible situation that some banks might experience problems owing an accumulation of losses stemming from credit risk or due to panic and problems with balance-sheet liquidity.

Box 9: Stress testing of banks' balance-sheet liquidity

To test banks' liquidity risk, we used a macro stress testing model based on a model of the Dutch central bank adapted to the Czech situation.[86] The model's value added consists in taking into account the link between balance-sheet and market liquidity, which is generated by banks' response to a liquidity shock. The liquidity risk that is the subject of the test stems not only from balance-sheet liquidity risk (the bank's ability to raise funds), but also from a strong link between the bank's balance sheet and market liquidity (the bank's ability to sell assets at a specified price). Taking this link into account significantly increased the sensitivity of the tested banks to macroeconomic and financial shocks and made the balance-sheet stress test more realistic compared to the very simple model used last year.

The model uses data on liquid assets and liabilities in the balance sheets of all banks active in the Czech Republic at the end of 2008. In this model, all liquid bank balance sheet items (both assets and liabilities) are exposed to shocks at the same time. This leads to a decrease in the market value of financial asset holdings and to withdrawals of deposits, which do not return to the banking system but are held as cash.[87]

The model assumes three subsequent steps that are logically interlinked (see Figure IV.1 Box). First, we assume that a sound banking system (with a predefined liquidity buffer B_0) is hit by a liquidity shock (bank runs and falling prices of securities holdings). This shock will have a negative effect on the balance-sheet liquidity of banks, which will respond if their liquidity buffer falls below a threshold value.[88] On the one hand, the banks' response will reduce the impact of the shock on the balance-sheet liquidity of individual banks, but on the other hand it will increase the reputational risk of each responding bank and the systemic risk through the simultaneous response of the banks on the financial markets.

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86 For a detailed technical description of the model see Van den End, J. W. (2008): Liquidity Stress-Tester: A Macro Model for Stress-testing Banks' Liquidity Risk, DNB WP No. 175, May 2008.
87 The magnitude of the shocks was derived using Monte Carlo simulation based on data on the potential variability of individual liquid items.
88 A bank will respond if its liquidity buffer falls by more than 40%. This threshold is set relatively low, ensuring that a sufficient number of banks will respond to the worsened liquidity situation.

A bank's reputational risk consists in signalling its liquidity problems. An increase in systemic risk occurs in this model when excessive one-sided pressure from banks on the financial market (e.g. all banks want to sell bonds) leads to a decline in market liquidity. The increase in these two risks feeds back in the form of a secondary shock to banks' balance sheets (a further decline in bond prices and a further outflow of deposits).

The initial liquidity buffer B_0 was calculated as the sum of unweighted liquid assets. The average initial liquidity buffer was almost CZK 389 billion (see Table IV.1 Box). The initial shock affects all liquid items, with the average impact on the balance sheet of each tested bank reaching almost CZK 159 billion. The liquidity buffer thus declined by roughly 41% to an average of CZK 229.5 billion (see Table IV.1 Box). All banks but one were hit, in particular large banks, foreign bank branches and building societies (B_1 was 40% lower than B_0 on average, see Chart IV.5 Box). In no case did the liquidity buffer turn negative (see Chart IV.6 Box).

A total of 14 banks crossed the threshold for the decline in the liquidity buffer and responded to the initial shock on the financial markets. A bank's response type is assumed to reflect its specialisation and exposure to the specific market. Hence, a particular bank will react, for example, by reducing its holdings of securities that are relatively important on its balance sheet, or, in the case of a bank with a strong deposit base, by attracting new deposits (at higher interest rates). We assume that there are sufficient counterparties (e.g. non-bank financial institutions) willing to purchase the securities even at the falling market prices.

The response of the 14 banks increased the liquidity buffer by CZK 73 billion on average, to CZK 302.7 billion (buffer B_2). A relatively large number of banks (almost 40%, in particular foreign bank branches and large banks) responded in a very similar manner. This behaviour led to a strong negative feedback reaction (a decline in market liquidity and further changes in market prices) and caused a second-round shock that hit all banks equally and at the same time. The second-round shock reduced the liquidity buffer by CZK 100 billion to CZK 202.7 billion (buffer B_3). Foreign bank branches, large banks and building societies were again hit hardest by the second-round shock (see Chart IV.5 Box).

Although the simulated shock was very strong and the assumptions were quite severe, no bank in the entire tested system had a negative post-shock liquidity buffer (i.e. an inability to pay for funds accepted by selling assets and thus de facto bankruptcy). This confirms that banks have very good balance-sheet liquidity and are resilient to potential liquidity shocks.

CHART IV.6 (BOX)
Change in liquidity buffers of individual banks

Legend: B_0 B_1 B_2 B_3
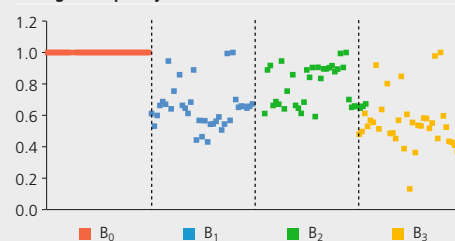
Source: CNB
Note: Each point denotes the ratio of the relevant buffer to the initial buffer of the bank.

TABLE IV.7
Scenario type and shock size in insurance company and pension fund stress test

	Europe in recession	Market nervousness	Economic depression
Change in CZK interest rates (p.p.)	-1.86	0.32	-1.65
Change in EUR interest rates (p.p.)	-2.92	-3.82	-3.63
Change in CZK/EUR exchange rate (- appreciation, %)	4.86	13.58	9.57
Increase in NPLs (reclassification, %)	5.43	6.35	7.85
Change in share value (%)	-10	-20	-30
Change in property prices (+ rise, - fall, %)	-10	-20	-30
Increase in risk in LI[1] (risk of epidemics, %)	3	3	3
Increase in risk in NLI[1] (risk of climate change, %)	50	50	50

Source: CNB
Note: [1] Insurance company test only. LI = life insurance; NLI = non-life insurance
Note: Changes in parameters represent the difference between 2008 Q4 and the average for 2009.

TABLE IV.8
Results of insurance company stress tests
(capital adequacy ratios; % and p.p.)

Scenario type	Europe in recession	Market nervousness	Economic depression
CAR[1] for insurers as a whole (%)	**11.9**	**11.9**	**11.9**
Overall impact of shocks from exposures (p.p.)	1.3	-1.6	-0.1
Interest rate shock	2.1	-0.2	1.9
Exchange rate shock	0.1	0.2	0.2
Credit shock	-0.2	-0.4	-0.4
Equity shock	-0.5	-1.1	-1.6
Property price shock	-0.1	-0.1	-0.2
Overall impact of shocks in insurance (p.p.)	-0.4	-0.4	-0.4
Life insurance	-0.1	-0.1	-0.1
Non-life insurance	-0.3	-0.3	-0.3
Allocation of profit and equalisation provisions (p.p.)	-1.3	1.6	0.2
Post-test CAR (%)	11.5	11.6	11.5
Capital injection (CZK billions)	6.0	6.3	6.1
Capital injection (% of GDP)	0.2	0.2	0.2
No. of insurers with negative capital	1	1	1
Share of insurers with negative capital[2]	0.1	0.1	0.1

Note: 1) Calculation for December 2008, derived for illustration from bank capital adequacy methodology.
2) The share of insurance companies with negative post-shock capital (as a percentage of total assets).

TABLE IV.9
Solvency and insurance company test results
(%)

Insurance type	Total	Life	Non-life
Europe in recession			
Solvency	308	276	337
Before allocation of profit and eq. provisions	312	337	292
Post-test solvency	274	261	284
Market nervousness			
Solvency	308	276	337
Before allocation of profit and eq. provisions	256	260	254
Post-test solvency	272	258	283
Economic depression			
Solvency	308	276	337
Before allocation of profit and eq. provisions	283	328	247
Post-test solvency	273	261	282

Source: CNB

TABLE IV.10
Summary of stress test results for pension funds
(capital adequacy ratios calculated using the methodology for banks; p.p.)

Scenario type	Europe in recession	Market nervousness	Economic depression
Overall impact of shocks (p.p. CAR)	16.0	-3.3	10.9
Interest rate shock	17.0	-2.3	15.1
Exchange rate shock	1.2	3.5	2.4
Credit shock	0.0	0.0	0.0
Equity shock	-2.0	-4.0	-6.0
Property price shock	-0.2	-0.4	-0.6

Stress test results for the insurance sector

The increased financial market volatility and the decline in prices of assets in which insurance companies invested their technical provisions also affected this sector. The capital adequacy ratio calculated according to the banking methodology for a comparable sample of 33 insurance companies fell from 13.3% in mid-2007 to 11.9% at the end of 2008.

The alternative scenarios B ("market nervousness") and C ("economic depression") would continue to have some adverse effects on the insurance sector in 2009. These adverse effects would amount to CZK 7.4 billion (roughly 70% of the average profit for the last two years) in scenario B and CZK 2 billion (19% of profit) in scenario C. In the less favourable scenario B ("market nervousness") insurance companies would use their income to cover the losses and maintain the required solvency level. It is assumed that this income would reach only 80% of the average for the last two years (see Table IV.8).

The aggregated impact of scenario A, which captures the most probable path of the economy combined with specific shocks in the insurance sector, would be positive at CZK 3.8 billion (35% of profit). This is due mainly to a decline in interest rates and a moderate depreciation, which largely eliminate the impact of the fall in prices of shares and mutual fund units as well as the impact of the part of specific risks not covered by premiums, provisions and reinsurance. It should be pointed out, however, that the tests do not take into account the sensitivity of liabilities to interest rates, in particular for life insurance companies. Given the longer duration of liabilities compared to assets, a decline in interest rates to very low levels would represent a problem for insurance companies, especially if rates remained low for a long time.

Insurance companies would be able to withstand the extreme stress ensuing from the specific shocks (climate change, epidemics) with an impact of around CZK 60 billion, even though this figure exceeds the clean-up costs of the 2002 floods by roughly one-third. This is due to the volume of technical provisions and above all payments by reinsurance companies. The stress test results indicate that the insurance sector as a whole would be able to withstand all the alternative scenarios and maintain a high ratio of disposable solvency to required solvency exceeding 270% (see Table IV.9).

Stress test results for the pension fund sector

Despite a capital increase in 2008, equity fell from 2.3% of total assets at the end of 2007 to 1.7% of total assets at the end of 2008 owing to the unfavourable financial market developments. The pension fund stress tests indicate only partial resilience to adverse shocks (see Table IV.10).

Given pension funds' high sensitivity to credit risk, the interest rate decline in scenarios A ("Europe in recession") and C ("economic depression") would have a positive effect on their overall results in 2009. Losses would be caused by alternative scenario B ("market nervousness"), which assumes an increase in interest rates. The losses under scenario B would be around CZK 1.8 billion (roughly 70% of average profit or 55% of equity at the end of 2008). Given the developments on the bond market in 2009 Q1 (see section 3.1), however, further bond price declines and thus further pension fund losses cannot be ruled out (see section 4.1). Of the three types of financial institutions tested, pension funds are the most sensitive to interest rate increases (see Chart IV.38). If the one-year interest rates in scenario B ("market nervousness") rose by 2 percentage points (and long-term rates by 1 percentage point), the fall in bond prices would eliminate the whole liquidity buffer. A capital increase of around CZK 8 billion would be needed to restore the initial capitalisation of pension funds. However, this represents only 0.2% of GDP.

Given the impacts of financial market developments on pension funds and the absence of regulatory rules for the capital of pension funds, the CNB is preparing new prudential measures together with the Association of Pension Funds of the Czech Republic. The aim is to put in place systemic mechanisms that will automatically trigger certain processes (e.g. provision of additional capital by shareholders) if a pension fund's equity declines below a specified threshold in the reference period. An amendment to the Act on Private Pension Insurance, which from 2009 H2 would allow pension funds to value some bond holdings at amortised cost instead of fair value, is also being discussed in Parliament. This measure is consistent with the long-term investment horizon of pension funds.

CHART IV.38
Smooth change in interest rate for scenario B "market nervousness"
(% capital adequacy; 2008)
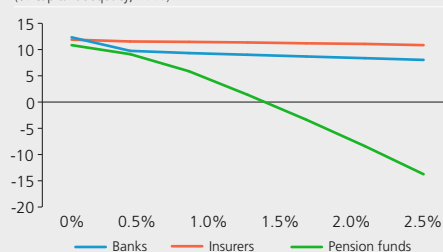
Note: For insurance companies and pension funds we assume a change in long-term interest rates (over 5 years) of 50% of the given rise in interest rates.

PART II – THEMATIC ARTICLES

INSTRUMENTS FOR CURBING FLUCTUATIONS IN LENDING OVER THE BUSINESS CYCLE

Jan Frait and Zlatuše Komárková

This article sets out to discuss instruments for reducing procyclical bank lending behaviour. Special attention is given to how much the regulatory framework contributes to the procyclicality of the financial system. The main subject of the article is the dynamic provisioning regime currently under discussion as one of the possible regulatory responses to the ongoing global financial crisis. The analysis reveals that Czech banks are among those that provision in a procyclical manner. On the theoretical level, therefore, dynamic provisioning could in the Czech economy help create a buffer during good times which could then be used during recessions. On the practical level, however, dynamic provisioning would for numerous reasons be difficult to introduce and would first need to be aligned with the other components of the international framework for the regulation of financial institutions.

1. INTRODUCTION

The financial crisis in progress since summer 2007 has greatly increased the interest of regulators – and economists generally – in the issue of procyclical lending behaviour. In the preceding decade, the discussion had been focused on the options for dampening growth in the loan supply in an upward phase of the business cycle, whereas in 2008 attention shifted to a sharp slowdown – or even freeze – in lending at a time of recession. In order to influence lending over the cycle, various countries have in the past tried either to use changes in monetary policy settings or to apply prudential, supervisory or even administrative measures. The bursting of the housing market bubble and the crisis in the residential mortgage market in the USA in 2007 and the subsequent global financial crisis have focused attention on how much the regulatory framework itself contributes to procyclicality. "Dynamic provisioning" is regarded as one of the instruments that might reduce the potential procyclicality of regulation.

This article analyses the cyclical behaviour of bank loans and loan loss provisioning in the Czech Republic in order to discuss the possibility of applying dynamic provisioning and the potential effects of such a step. Section 2 introduces possible instruments for curbing excess lending and discusses the position of dynamic provisioning in that set of instruments. Section 3 describes the main features of dynamic provisioning in detail. Section 4 examines bank loans and provisioning in relation to the business cycle in the Czech Republic in an attempt to identify whether these variables behave procyclically. Section 5 illustrates a simple dynamic provisioning method on data from the Czech economy. Section 6 evaluates the possibility of implementing dynamic provisioning in practice.

2. PROCYCLICALITY AND INSTRUMENTS FOR CURBING IT

Financial system procyclicality means the ability of the financial system to amplify fluctuations in economic activity over the business cycle via procyclicality in financial institutions' lending and other activities. The procyclical behaviour of financial markets transmits to the real economy in amplified form through easy funding of expenditure and investment in good times and financial restrictions leading to declining demand in bad times.

One of the most hotly debated subjects in the last ten years has been whether monetary policy instruments or regulatory and supervisory instruments should primarily be used to curb excessive lending. Previously, the prevailing view was that the central bank should focus its monetary policy instruments on achieving its macroeconomic goals while using its regulatory, supervisory, and lender-of-last resort powers to help ensure financial stability (Bernanke, 2002). The IMF has also examined the instruments available for curbing excessive credit growth in previous years in the spirit of this rule. In its World Economic Outlook (September 2005, p. 13),

for example, it stated that in cases where house price inflation remained robust, a combination of moral suasion and, if necessary, prudential measures could help limit potential risks. Over the longer term, according to the IMF, regulatory measures – including those that potentially constrain the supply of financing – could be used. Hilbers et al. (2005) provide a long list of possible measures.[1] The main prudential measures include higher/differentiated capital requirements, tighter loan classification and provisioning rules, the introduction of dynamic provisioning, tighter collateral rules and tighter eligibility criteria for certain categories of loans. The supervisory measures include increased disclosure requirements, more frequent and closer inspections and periodic stress testing. Some countries have introduced administrative measures such as bank-by-bank credit limits or mandatory allocation of loans. In reality, however, many of these measures have had a limited impact, for example because the activities of domestic banks subject to stricter regulation have been replaced by the activities of non-bank and foreign institutions. Some measures have of course also had negative side effects. For this reason, among others, an alternative solution – dynamic provisioning[2] – has started to be discussed. The remainder of this article is devoted to this topic.

3. SPECIFIC, GENERAL, AND DYNAMIC PROVISIONS

Banks set aside provisions to cover their expected losses. Their capital should primarily be used to cover unexpected losses. There generally exist several provisioning systems differing in either when the provisions are created and entered in the accounts or what event triggers provisioning (see Figure 1). The prevailing practice is "specific" provisioning. Specific provisions are fixed against losses on predominantly individually assessed loans and start at the moment an evident event occurs, i.e. in a situation where there is already verifiable evidence that losses will probably arise on the relevant loans. For this reason, specific provisioning is backward looking (i.e. it identifies risk ex post). General and dynamic provisions, where permitted by the authorities, are against losses from portfolios of loans and can be forward looking (i.e. they identify credit risk ex ante). Simplifying somewhat, we can say that the international accounting standards currently in force (IAS 39) allow banks to provision only for loans for which there is clear evidence of impairment (i.e. backward-looking provisioning).

Figure 1: Potential events resulting in provisioning
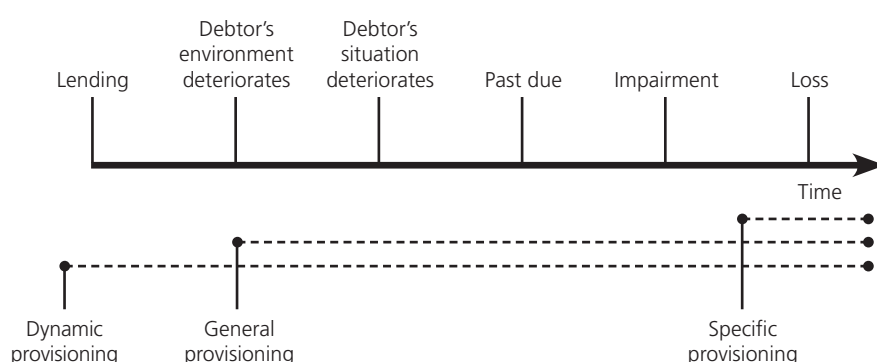
Source: Banque de France (2001), authors' changes

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1   Prudential measures should be aimed at fostering a forward-looking risk management approach and should generate a buffer to soften the impacts of an adverse phase of the cycle.
2   The Economist, for example, referred to dynamic provisioning as an important element that helped the Spanish banking system to prepare at least partially for the downside of an economic cycle (Spanish Steps. The Economist, 15 May 2008).

One can say – again simplifying somewhat – that specific provisions are created and entered in the accounts only after credit risk comes to light (which usually occurs in times of recession), whereas in the dynamic provisioning system provisions are created when credit risk comes into being (i.e. to a large degree in times of boom). So in the dynamic provisioning system, banks provision against existing loans in each accounting period in accordance with the assumption for expected losses. At times when actual losses are smaller than assumed a buffer is created which can then be used at times when losses exceed the estimated level.

Certain features of dynamic provisioning have been used by banks in some countries in the past on a voluntary basis. Likewise, certain regulators have used methods based on assessing expected or potential losses and provisioning for those losses. However, it was not until 2000 in Spain that a comprehensive and mandatory system for the application of dynamic provisioning was introduced in order to reduce procyclicality in bank behaviour.[3] In the period 2000–2004, in addition to specific and provisions general[4] against the profit-and-loss account, Spanish banks set aside "statistical provisions" (a statistical estimate of long-term expected losses) to cover the latent risks on the different homogeneous asset portfolios. The statistical provisions had the nature of dynamic provisions, as they rose when the actual losses in a given year were lower than statistically predicted and fell when the actual losses were higher. The statistical provisions had a fixed upper limit and were not tax deductible. The system was introduced at a good time, i.e. well before the onset of the recession and financial crisis. This allowed a buffer to accumulate to cover future losses. The expected and desired result of this system was a reduction in the year-on-year volatility of bank profits.

The introduction of dynamic provisioning in Spain in 2000 was not easy. Banks had major reservations at first. Nor was it welcomed by the setters of international accounting standards, who argued that it allowed manipulative adjustment of profits and thereby limited investors' ability to assess the true financial condition of the bank. The counter-argument was that investors had information on both specific and statistical provisions and were also aware of the relatively simple rules according to which the statistical provisions were created. As a result, they could easily discount the impact of the statistical provisions on the bank's financial results in any given year and thus had enough information on the bank's true financial condition. In response to the introduction of International Financial Reporting Standards (IFRS), the provisioning system in Spain was modified in 2005, although even the new system retained certain features of dynamic provisioning. Statistical provisions were "concealed" in the general provisions through comparison of the specific provisions actually set aside in a given period with the historical average of the specific provisions in each group of homogeneous loans. However, even this modification failed to lead to agreement between the creators of international accounting standards and the Spanish authorities.[5]

The application of elements of dynamic provisioning enabled Spanish banks to build up quite a large buffer in the form of accumulated provisions in just a few years. Even after the 2005 reform, banks maintained a high level of provisions in accordance with the regulations previously in force and entered the financial crisis at the end of 2007 with a fairly sizeable buffer in the form of a general provision fund. At the start of 2008, non-performing loans were 200% covered in Spain, while the EU average was around 60%. At the time of writing, Spanish banks were – thanks to this buffer – not exposed to the same kind of difficulties as banks in some other European countries. It is reasonable to assume that without this buffer of accumulated provisions Spanish banks would have been in a far worse position in the present phase of the crisis, especially given the slump in property prices and the potential depth of the recession. Whether these accumulated provisions are sufficient to maintain the stability of the banking system will only become clear as the recession unfolds.

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3   One of the primary reasons was the Spanish central bank's concerns that amid rapid credit growth supported by declining interest rates connected with the introduction of the euro, the existing provisions greatly underestimated the extent of the potential credit risk. The fact is, however, that although in the early years the system absorbed a significant proportion of banks' pre-tax profits (around 20%), bank loans still grew at very high rates in this period (Caruana, 2005). This supports the hypothesis that credit booms are highly complex events that are difficult to influence with standard instruments.

4   General provisions were set as a fixed percentage of the specific asset class and were tax deductible.

5   The Spanish authorities regard the new system as being IFRS compatible. Referring to IAS 39 (point 64), they argue that the general provisions are the result of collective assessment for impairment, capturing incurred losses that have not yet been assigned to individual loans. They thus cover loans whose losses have not yet been individually assessed and loans that have been assessed but not identified as impaired.

4. DO CZECH BANKS BEHAVE PROCYCLICALLY WHEN PROVISIONING?

One of the instruments for analysing the degree of procyclicality in banks' behaviour is analysis of provisioning over the business cycle. Chart 1 shows that there is a negative relationship between GDP growth and the ratio of loan loss provisions to total loans in the Czech Republic for the period 1998–2008. This relationship, which should be a logical consequence of the prevailing IFRS-based provisioning system, will be subjected to an empirical analysis. The results should reveal the extent to which other factors affecting banks' behaviour constrain the aforementioned negative relationship.

Chart 1: Loan loss provisions/total loans and GDP growth (Czech Republic, 1998–2008)
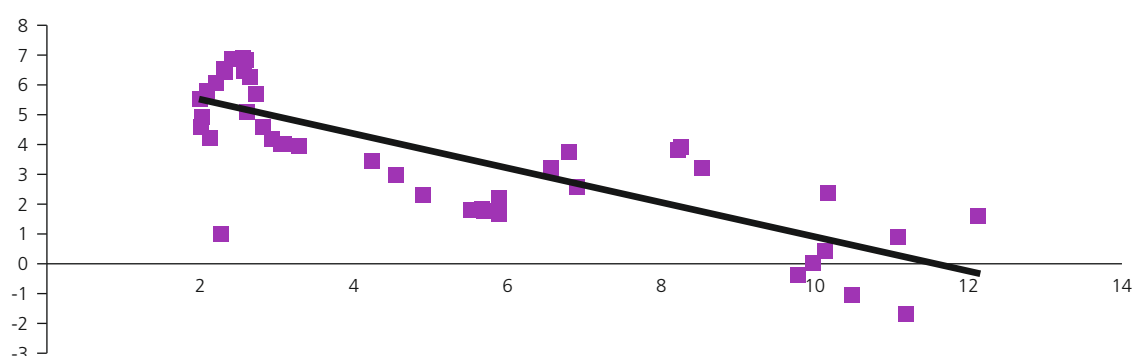
Source: CNB, CZSO
Note: y-axis: GDP growth in %; x-axis: ratio of provisions to loans in %

The creation of provisions – especially those directly linked to impaired loans ("specific provisions") – can be affected by changes in the macroeconomic environment, the solvency of counterparties to lending transactions, the regulatory and taxation rules in force and, last but not least, by the actual behaviour of a particular bank in a given environment.[6] Consequently, to examine bank provisioning over the economic cycle, one needs to use a model with variables that accurately reflect the changing quality of the loan portfolio. To reveal the potential procyclical behaviour of Czech banks, we applied the model developed by Bikker and Metzemakers (2003), modified slightly in order to analyse the behaviour of the banking sector of a single country. The model has the following form:

$$(LLP/TA)_{i,t} = \alpha_1 + \alpha_2 \cdot \Delta \ln GDP_t + \alpha_3 \cdot UNEMPL\_gap_t + \alpha_4 \cdot (EARN/TA)_{i,t} + \alpha_5 \cdot \Delta \ln LOANS_{i,t} + $$
$$+ \alpha_6 \cdot (LOANS/TA)_{i,t} + \alpha_7 \cdot (CAP/TA)_{i,t} + \varepsilon_{i,t}$$

(1)

Using this equation we try in a simplified way to determine banks' dependence on the business cycle when provisioning. In other words, we determine whether there is a significant relationship between bank provisioning (the left-hand side of the equation) and proxies for the business cycle (the right-hand side of the equation). An important aspect when looking at this dependence is the timing of provisioning with respect to the business cycle and the related issue of procyclicality.

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6   A profit-maximising bank will clearly behave differently from a market-share-maximising bank, even if they operate in the same environment.

The variables in the equation can be divided into (i) macroeconomic variables – the growth rate of real GDP ($\Delta \ln GDP$) and the unemployment gap (UNEMPL_gap[7]), and (ii) bank-specific variables – the ratio of loan loss provisions to average total assets[8] (LLP/TA), loan growth ($\Delta \ln LOANS$), the ratio of total loans to average total assets (LOANS/TA), pre-tax earnings (EARN) and the ratio of equity capital to average total assets (CAP/TA). Subscript "t" denotes time, "TA" stands for the average total assets for the two periods ($0.5(TA_t + TA_{t-1})$), and subscript "i" denotes the individual banks.

The growth rate of real GDP and the level of unemployment are used in the equation to proxy the business cycle. If banks behave procyclically, the rate of economic growth will be negatively correlated with provisioning, because an economic downturn is usually followed by growth in the volume of provisions. In our model, economic growth is regarded as the main indicator of demand for banking services (including loans) and is thus a direct determinant of banks' earnings. The unemployment rate should logically be positively correlated with provisioning. At a time of economic growth unemployment falls and the number of creditworthy borrowers increases. Conversely, at a time of economic recession, unemployment rises and the probability of default increases. The unemployment rate follows GDP growth with a lag and affects banks' earnings indirectly. It was included in the model because unlike GDP, which "only" indicates the degree of change in the business cycle, the level of unemployment shows the actual phase of the cycle.

The other factors in the equation are loan growth and the ratio of total loans to total assets, which we included in order to capture credit risk. Both these variables should tend to be negatively correlated with provisioning. An increase in the loan growth rate (indirectly growth in credit risk) usually reflects over-optimistic expectations about future economic developments and future earnings.[9] Over-optimistic expectations and misestimation of credit risk, in turn, usually result in a low growth rate of provisions relative to loan growth. In other words, as credit risk increases the level of hedging against it de facto decreases. However, the relationship between these factors might also be positive. If banks behaved prudently, as the dynamic provisioning model assumes, as credit exposures rose the rate of growth of provisions would also increase due to the probably growing credit risk. This model of behaviour is considered less likely, though.

Another variable in the model is pre-tax profit, which should be positively correlated with provisioning. Provisioning increases with rising profits. The main reasons for this can be smoothing of income over time or tax optimisation. Banks may also try to win credibility by posting almost constant profits over several years. Banks with less volatile income tend to be regarded as good performers, which then influences their share prices, external ratings and external funding costs and ultimately also management incomes. The declared profit subsequently determines the amount of tax levied. Banks can influence their profit to some extent by adjusting the amount of provisions they set aside.[10] If a bank smooths its income (or optimises its taxes), it will reduce its "excessive" profits, which rise at times of economic growth, by means of increased provisioning, and vice versa.

The final variable included is the ratio of equity capital to total assets. Loan losses are generally divided into expected losses and unexpected losses. Expected losses are assumed to be covered by provisions, whereas unexpected losses are assumed to be covered by capital. The equity capital to total assets ratio is therefore an important indicator of the capacity of a bank to absorb unexpected shocks. The relationship between provisioning and capital can be either negative or positive. If a bank takes into account its equity ratio when provisioning, the relationship between the variables is negative. The amount of provisions thus depends to some

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7   The gap was used for the purposes of the model because the trend was too encumbered by the sizeable growth in long-term unemployment that began to emerge in the 1990s. The calculation was performed using the Hodrick-Prescott filter.
8   We chose the ratio to total assets (the sum of the assets of all the banks under review) to allow for comparison across banks of different sizes.
9   Assessing developments can be more difficult in transforming economies, as the credit growth rate can be particularly high at the start of the transformation process owing to a low base, financial system development and real convergence. In specific cases, therefore, it may be better to consider deviations of the credit growth rate from the trend.
10 Uniform application of international accounting standards should prevent this practice.

extent on the size of its capital buffer. If the bank decides that its capital buffer is large enough to cover any loan losses arising, as is usual at times of credit (economic) expansion, its provisioning may be excessively low. When the business cycle changes, or if an unexpected shock occurs, the excessively low level of provisions may not be enough to cover the bank's expected losses and it will be forced to cover them from its capital buffer. Its capital will thus be covering not only unexpected losses, but also expected losses, which may ultimately have an adverse effect on its capital adequacy compliance. By contrast, a positive relationship would suggest that provisions and capital are more or less independent of each other. The bank thus sets aside loan loss provisions no matter how large its capital buffer is. If we observe procyclicality in provisioning, a negative correlation can be presumed for the capital-provisioning relationship. As the economy grows, the capital buffer of the bank expands and provisioning decreases.

To estimate the procyclicality in provisioning, we used quarterly data for the period 1997–2008 from the balance sheets of large banks operating in the Czech Republic at the end of 2008. We realise that the results may have been partially influenced by the fact that the time period is not sufficiently long[11] to represent the recommended two complete business cycles. The initial phase of the chosen period was additionally accompanied by structural problems in the banking system. However, the time period should be sufficient to test the behaviour of the banking system over the cycle. The macroeconomic variables entering the model were taken from official CZSO figures, and data specific to individual commercial banks were obtained from internal CNB sources. The regression model was estimated as a panel regression. To illustrate dynamic provisioning (section 5) we shortened the time period further because of the aforementioned structural problems in the 1990s and we performed the illustration for 2001 onwards. Table 1 presents the estimated results of equation (1) for the chosen sample.

Table 1: Results of panel regression for loan loss provisions[12]

Variables	Coefficients	Std. deviations	t
LLP/TA, lagged by 1Q	0.3390	0.5084	6.67***
GDP growth	-0.0003	0.0020	-1.74**
Unemployment gap	0.0012	0.0006	1.84**
Pre-tax profit	0.6565	0.0567	11.57***
Loans growth	-0.0022	0.0022	-1.00
Loans/TA	0.0118	0.0048	2.46***
Capital/TA	-0.2230	0.0319	-6.98***
No. of observations	172		
R^2 – within (between banks)	0.942	R^2 – overall	0.947
R^2 – between (over time)	0.993	rho	0.102
F (7, 161)	375.46	Prob > F	0.000
F test of equality of constants for banks (FE)			
F (3,161)	2.24	Prob > F	0.0857

Note: The data were statistically significant at the ***1%, **5% or *10% level.

11 De Lis et al. (2001), for example, used Spanish data covering a 16-year period, representing two full business cycles.
12 Given the nature of the variables under review, a fixed-effects model was used. The F-test of equality of the constants for fixed effects rejects the hypothesis of equality at the 9% level of significance and thus partly confirms some small degree of specificity across banks. We tested the panel data for non-stationarity using the Hadri panel unit root test.

Almost all the variables, macroeconomic and bank-specific, had a statistically significant effect on the size of the loan loss provisions. Only the coefficient on loan growth was insignificant. As expected, the coefficient on GDP growth was negative (see Table 1, GDP growth), indicating that provisioning is higher during economic downswings and lower during upswings. The positive coefficient on the unemployment gap (see Table 1, unemployment gap) also suggests that provisioning is significantly procyclical and lacks forward-looking assessment of cycle-related risk.

The procyclicality in banks' provisioning behaviour may be partly offset by the evolution of gross profit. Given its positive, and relatively high, coefficient (see Table 1, pre-tax profit) it is apparent that banks provisioned more as profits rose and less as they fell. The results thus suggest that banks tried to smooth their income (or optimise their taxes) in the period under review by provisioning. This behaviour thus partially reduces the procyclicality expressed by the coefficient on GDP growth.

The resulting positive coefficient for the relationship between provisioning and the ratio of total loans to total assets (see Table 1, loans/TA) confirms a generally positive effect of credit risk. The coefficient indicates that Czech banks tend to behave prudently. If a bank has a relatively large open credit position, for which there is a higher probability of rising credit risk, it sets aside more provisions.

The final relationship under review is that between the equity capital to total assets ratio and provisioning. These variables are negatively correlated (see Table 1, capital/TA), supporting the assumption discussed above that banks are influenced in their provisioning by their capital ratio. In other words, banks set aside fewer provisions to cover their expected losses when their capital buffer is larger.

To sum up, the results confirmed the assumptions regarding the procyclical provisioning behaviour of banks. It is clear, therefore, that the provisioning performed by Czech banks contains a cyclical component which might be smoothed to some extent by the introduction of dynamic provisioning, for example.

5. ILLUSTRATION OF DYNAMIC PROVISIONING

This section contains an illustration of a simplified dynamic provisioning method for the Czech banking system. The illustration is performed on historical data from the start of 2001 to the end of 2008. The input variables are the actual total loans that banks provided to their customers and the actual provisions set aside for those loans.

In section 3 we described the main difference between the standard provisioning system, where, in simplified terms, total provisions (TP) created by banks equal specific provisions (actual provisions, AP), and the dynamic provisioning system, where total provisions comprise both specific provisions and "statistical" provisions (SP). For the purposes of our simple illustration of the dynamic provisioning system, we also subdivide total provisions into two parts – specific provisions and statistically estimated provisions, as shown in equation (2)[13]:

$$TP = AP + SP \tag{2}$$
$$SP = 0.54\,(3.95 - AP) \tag{3}$$

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13 Provisions are expressed as a share of total credit claims against non-credit institutions.

Specific provisions for loans provided by banks are generally created at the moment the losses on such loans come to light and it becomes evident that the loans are "at risk" of default. In the equation we used the actual provisions created by Czech banks as specific provisions. Statistical loan loss provisions (equation (3)) are understood to mean an additional fund created to cover the probable future loss on loans provided. In our simple illustration, we calculated statistical provisions as the difference between the statistically estimated component of the provisions (3.95) and the specific provisions. As in the Spanish model of dynamic provisioning (de Lis et al., 2001) we obtained the value of 3.95 by averaging the ratio of specific provisions to loans provided over the business cycle (2001–2008).[14]

Equation (3) implies that if the statistical provisions in the dynamic provisioning system are positive (SP > 0), banks create an additional fund of provisions on top of their specific provisions and so total provisions can exceed specific provisions (equation (2), TP > AP). This differentiates the dynamic provisioning system from the standard provisioning system, where total provisions equal specific provisions (TP = AP, because SP do not exist). This situation is typical of a period of economic growth, when specific provisions have a tendency to decline. Statistical provisions thus ensure that the total provisions set aside by banks do not fall too much at times of economic growth. Conversely, if the statistical provisions are negative (SP < 0), banks can draw on the fund created earlier and so their specific provisions need not grow significantly. Hence, total provisions need not rise, as they would have to in the standard provisioning system. The factor of 0.54 was calculated as the ratio of the standard deviation to average actual provisions (AP). The average for actual provisions was roughly twice as high during a downswing than during an upswing. By using this factor we reproduced the different volatility of the time series in the business cycle under review.

Chart 2 compares the evolution of provisions over time in the standard provisioning system and in the hypothetical dynamic provisioning system. It shows that in the illustration there was a decrease in the cyclical component (the difference between the red line and the green line) contained by the provisions in the standard provisioning system.

Chart 2: Comparison of standard and dynamic provisioning systems (percentages)
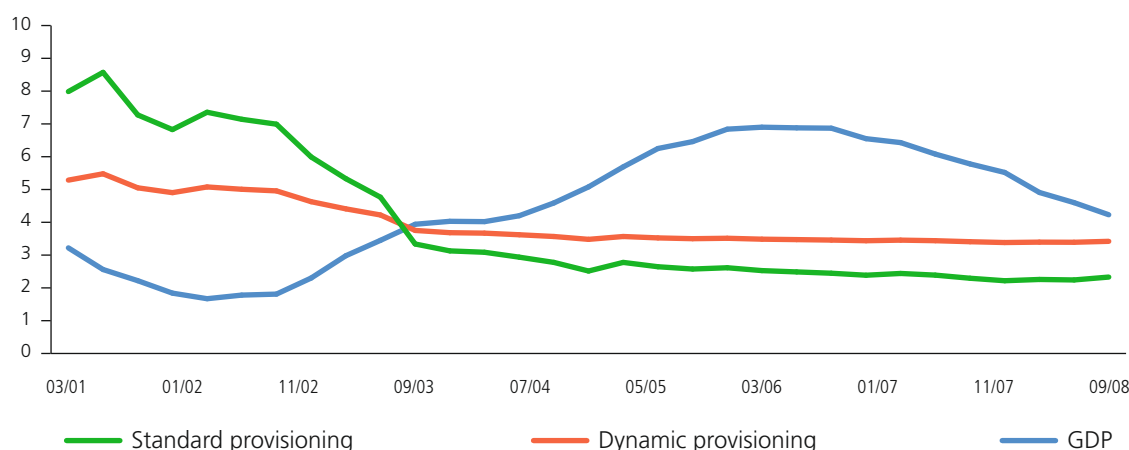
Source: Authors' calculations based on CNB and CZSO data

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14 Our illustration is somewhat simplified. The Spanish system first of all classifies loans by credit risk into six categories and only then computes the average net specific provisions over the business cycle.

In the dynamic provisioning system, assuming unchanged bank behaviour, the need to set aside total provisions would have decreased during the downswing and trough phases (until 2002 Q3; use of fund) and increased during the upswing and peak phases (creation of fund).

6. BARRIERS TO THE PRACTICAL IMPLEMENTATION OF DYNAMIC PROVISIONING

The results of the above illustration do not in themselves represent a strong argument for putting dynamic provisioning into regulatory practice. It is important realise that there is currently no "best practice" for a system of this sort. Any country seeking to introduce it would have to address a whole range of difficult questions.[15] Current international accounting standards constitute a major barrier to dynamic provisioning, as the latter is not compatible with the former. Efforts towards isolated application at the national level would have many negative consequences. What is more, the introduction of dynamic provisioning is not a practical option for many advanced countries, including the Czech Republic, in the next few years owing to the current phase of the credit cycle. It is impossible to create a fund of dynamic provisions in a situation where the quality of bank portfolios is deteriorating as a result of declining economic activity.

A key item for discussion is the true influence of dynamic provisioning on credit growth and bank stability. It is likely that during a strong boom the system would not provide a sufficiently strong negative incentive for banks as regards lending. Although it would help to create a buffer for worse times, this buffer might prove to be inadequate in a deep recession anyway. In other words, dynamic provisioning can hardly alone prevent the negative impacts of strong booms followed by strong recessions.

Other instruments besides dynamic provisioning can be used to curb the procyclicality of banking activities. A natural candidate is a modification of the method of setting capital requirements derived from Basel II so that a capital buffer is effectively created during a boom. This buffer could then be used at times of weaker growth or recession. Both instruments could be applied complementarily. In addition, they could be supplemented with simple mechanisms such as the setting of upper limits on leverage ratios for individual banks.

7. CONCLUSIONS

The main subject of this article was the dynamic provisioning regime currently under discussion as one of the possible regulatory responses to the ongoing global financial crisis. The analysis revealed that Czech banks provision in a procyclical manner. Theoretically, therefore, dynamic provisioning could in the Czech economy help to create a buffer during good times which could then be used during recessions. From the practical perspective, though, the uncoordinated introduction of dynamic provisioning at national level is hard to envisage for many reasons. However, a whole range of possible measures and combinations thereof can be expected to be discussed in the years ahead with a view to reducing the procyclical effects of the regulation of financial institutions. Dynamic provisioning will probably form part of this discussion, as was the case years ago during the preparation of the Basel II capital accord.

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15 One of the critical points is the method of estimation of the expected future loss. The first option is to let banks perform such estimates themselves on the basis of data on past losses and to have the regulator verify the models used. For numerous practical reasons, however, it might be more appropriate to base such estimates on standard assumptions set by the regulator, who would set risk weights for the individual asset classes. Mann and Michael (2002) discuss a whole range of such practical aspects.

REFERENCES

BANQUE DE FRANCE (2001): *The Financial Cycle, Factors of Amplification and Possible Policy Implications for Financial and Monetary Authorities*, Bulletin No. 95, Banque de France.

BERNANKE, B. (2002): *Asset-Price "Bubbles" and Monetary Policy*, Remarks before the New York Chapter of the National Association for Business Economics, New York, October 15, 2002.

BIKKER, J. A., METZEMAKERS, P. A. J. (2003): *Bank Provisioning Behaviour and Procyclicality*, DNB Staff Reports No. 111, De Nederlandsche Bank.

CARUANA, J. (2005): *Monetary Policy, Financial Stability and Asset Prices*, Banco de España, Documentos Ocasionales No. 0507/2005.

CAVALLO, M., MAJNONI, G. (2002): *Do Banks Provision for Bad Loans in Good Times? Empirical Evidence and Policy Implications*, in Levich, R., Majnoni, G., Reinhart, C. (eds.): Ratings, Rating Agencies and the Global Financial System, Kluwer Academic Publishers, Boston, Dordrecht, London.

CORTAVARRIA, L., DZIOBEK, C., KANANYA, A., SONG, I. (2000): *Loan Review, Provisioning, and Macroeconomic Linkages*, IMF Working Paper No. 00/195.

DE LIS, F. S., PAGÉS, J. M., SAURINA, J. (2001): *Credit Growth, Problem Loans and Credit Risk Provisioning in Spain*, BIS Papers No. 1, pp. 331–353.

HILBERS, P., OTKER-ROBE, I., PAZARBASIOGLU, C., JOHANSEN, G. (2005): *Assessing and Managing Rapid Credit Growth and the Role of Supervisory and Prudential Policies, Washington,* D.C., International Monetary Fund, Working Paper No. WP/151/05, July 2005.

KRAFT, E. (2004): *Dynamic Provisioning: Results of an Initial Feasibility Study for Croatia*, Paper prepared for the Banking Supervisors of Central and Eastern Europe Conference, Dubrovnik, Croatia, 27–28 May 2004.

LAEVEN, L., MAJNONI, G. (2003): *Loan Loss Provisioning and Economic Slowdowns: Too Much, Too Late?* Journal of Financial Intermediation, Vol. 12, pp. 178–197.

LOWE, P. H. (2003): *Credit Risk Measurement and Procyclicality*, in Kuppers, J. G., Prast, H. N., Wesseling, A. A. T. (eds.): Banking Supervision at the Crossroads, Edward Elgar, Cheltenham, UK, and Northampton, MA, USA, pp. 136–163.

MANN, F., MICHAEL, I. (2002): *Dynamic Provisioning: Issues and Application*, Financial Stability Review, Bank of England, December 2002.

TURNER, P. H. (2000): *Procyclicality of Regulatory Ratios?* Working Paper No. 13, Center for Economic Policy Analysis.

PROPERTY PRICE DETERMINANTS IN THE CZECH REGIONS

Michal Hlaváček and Luboš Komárek

This article, based on an empirical analysis, discusses factors affecting property prices and tries to identify periods of property price overvaluation by time series analysis for the Czech Republic as a whole and by panel regression for the Czech regions. The time series analysis identifies overvalued property prices in 2002/2003 and 2007/2008. In 2007/2008, however, the rise in property prices was largely explainable by fundamentals, meaning that the price overvaluation in this period was considerably smaller than that in the first. From the regional perspective, there is a higher degree of overvaluation in regions with higher property prices. The exception is Prague, which seems to be a "specific" region – partly due to the properties of the estimation technique.

1. INTRODUCTION

Property prices surged in the Czech Republic in 2007. The rise continued in 2008 despite the fact that the global financial crisis had already led to major falls in property prices in countries where such prices had surged in the previous decade. A simple comparison of property prices in the Czech Republic and in other countries raises questions about whether the Czech Republic, too, faces such a property price bust and whether the recent growth is a sign of a "bubble" which, if it bursts, might have grave macroeconomic and social consequences.[16] Historical experience shows that the effects when housing market bubbles suddenly burst are accompanied by larger output losses and last longer on average (4 years) than those when stock market bubbles burst (1.5 years). Housing market bubbles pose a greater threat to the financial stability of a country/region if mortgage loans account for a large proportion of total loans (see, for example, Helbing and Terrones, 2003, or Bordo and Jeanne, 2002).

The effect of asset price bubbles on the functioning of the economy can distort the economic and investment decisions of individual economic agents. Their impact can pass through to the housing market via: (i) household consumption through the wealth channel (growth in the prices of property and financial assets held by households is perceived as growth in wealth and consumption financing sources); (ii) the banking sector balance sheet (property prices often serve as collateral in lending operations).[17] These effects differ in strength over time and across economies, but they affect the real economy all the same.[18] What is more, the economic literature does not offer clear recommendations regarding the degree of activity and preventiveness of central bank action – see, for example, Roubini (2006) and Posen (2006) and, for an application to transition economies, Frait and Komárek (2007).

Whether it is possible to identify excessive growth in past and present property prices in the Czech Republic depends to a large extent on whether this growth can be explained using standard demand and supply mechanisms and macroeconomic and demographic indicators and/or various structural characteristics of the housing stock. In addition to the usual difficulties relating to the heterogeneity of property as an asset, such an assessment is complicated by the convergence nature of the Czech economy, where property prices were probably "undervalued" at the start of the period under review and so part of their growth can be classed as "catching-up" with the usual level in developed economies, a process also linked with the constantly expanding

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16 We define an asset price bubble simply as an explosive and asymmetrical deviation of the market price of an asset from its fundamental value that has the potential to correct suddenly and sharply. Asset price bubbles are often caused by psychologically and behaviourally determined factors, self-fulfilling expectations and suchlike. This makes them difficult to identify from both the ex-ante and ex-post perspective.

17 If property prices rise, the probable loss from selling the collateral on a mortgage loan decreases, which, in turn, notionally increases the bank's capital and allows it to expand its investments and loans. However, a slump in property prices can lead to credit constraints, a credit crunch and a negative impact on economic activity.

18 According to many studies (e.g. Bordo and Jeanne, 2002, and Borio and Lowe, 2002), credit booms and asset price busts have had grave financial and economic consequences leading to financial crises in emerging markets.

mortgage market in the Czech Republic. Analysis of property prices for the Czech Republic as a developing economy is also complicated by the relatively low liquidity of its housing market, particularly at the start of the transformation process, by comparatively large changes in housing quality growth, which price indices are unable to identify, and by the distorting effects of the persisting regulation of rents.

In the article, we apply two alternative approaches to determining "equilibrium prices". In the first, we try to explain by time series regression analysis the growth in property prices in the Czech Republic as a whole and in Prague as its capital city, which can be expected to show a different trend than the rest of the country and to display a "price leader" effect. For this analysis, we use quarterly property transfer price index data for the period 1998 Q1–2008 Q3. The figures for 2008 are estimated from supply prices. In the second approach, we apply panel regression analysis on annual data for 1998–2007, with dependent variable being property transfer prices in the individual Czech regions. Most of the explanatory variables in the panel regression were also obtained in a regional breakdown. Égert and Mihaljek (2008) performed a similar analysis across the countries of the Central European region.

2. FACTORS DETERMINING PROPERTY PRICES

The fundamental factors determining property prices in the Czech Republic on which the quantitative analysis below is performed can traditionally be divided into supply and demand factors (see, for example, HM Treasury, 2003, or Égert and Mihaljek, 2008).[19] Their descriptive statistics for the average Czech region, based on annual data, are given in Table 1. The source of data on apartment prices was CZSO property transfer prices.[20] Except for the housing loan volume (CNB figures combined with MRD data) and the estimate of market rent (IRI), all the other data came from the CZSO as well. Among other things, Table 1 confirms the assumption that the variability of apartment prices and their individual determinants is in most cases higher – sometimes quite a lot higher – across regions than over time.

Supply factors

Supply on the housing market is generally driven primarily by the profitability of the construction business and is regarded as sticky in the short run (see, for example, Poterba, 1984). The housing market is often divided into two segments: the segment of existing housing with inelastic supply, where the price is already fixed, and the segment of new housing construction, where the price determines the amount of new construction. Supply in the existing housing market can be proxied using the saturation of housing needs (the number of apartments per 1,000 inhabitants) or the dynamics thereof (the number of newly completed apartments). Higher saturation of housing needs should lead, ceteris paribus, to lower upward pressure on apartment prices.

The supply factors also include the majority of cost factors, such as land prices, average apartment acquisition amounts and building construction costs (the construction work price index). All these cost factors can proxied using "apartment construction prices", which aggregate the total projected construction investment costs. Another possibility is to use the construction output price index. A rise in the costs of acquiring a new apartment should, at a given level of demand, lead to a rise in the value of existing apartments. Supply factors often pass through to property prices with a long lag, due to the long time it takes to prepare and actually implement a construction project.

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19 Égert and Mihaljek (2008) explain real property prices using real variables. In their paper, real variables are calculated from nominal ones deflated by the national consumer price index. However, CPI data were not available for individual regions. Moreover, it is reasonable to assume that the price variability across regions and over time was low relative to the variability across transition countries. As a result, we opted for an analysis based on nominal variables. That said, we performed a calculation by deflating to real variables using the nationwide CPI, but the results turned out to be similar to those obtained using nominal variables.

20 The CZSO computes property transfer prices from data taken from property transfer tax returns. In addition to a large data publication lag, this may imply some data distortion due, for instance, to tax optimisation. On the other hand, these data are more reliable than estate agencies' supply price figures.

Demand factors

Demand for property is determined primarily by households' disposable income, the main component of which is wages and salaries. They affect both the accumulation of savings and wealth by households and the availability and riskiness of housing loans. Other labour market factors that can influence property prices include the unemployment rate, the economic activity rate of the population and the number of vacancies. These factors mostly affect disposable incomes either directly (lower unemployment and a higher economic activity rate of the population mean higher disposable income of households at any given wage level) or indirectly via labour force mobility (migration in search of work). With the exception of unemployment, growth in labour market factors should lead to growth in apartment prices.

Apartment prices can also be affected by various demographic factors: linked with the aforementioned labour market factors is population growth due to migration; natural population growth should act in the same direction. Property price growth should also be fostered by a higher divorce rate, as most divorces turn one household into two, thus giving rise to a need for a new dwelling. The marriage rate can act in the same direction, as a wedding often establishes a completely new household. Demand for housing can also be affected by the age structure of the population, which, however, is reflected in the economic activity rate of the population.

The major factors of property price growth have recently also included the development of the financial market. This is being reflected primarily in growth in housing loans and is reducing the liquidity constraints on households when acquiring their own housing and should therefore be pushing property prices upwards. The mortgage interest rate (proxied by the one-year money market rate) is acting in the opposite direction, as its growth is making loan financing of property purchases less attractive and increasing households' repayments of existing loans. Demand from abroad can affect demand for housing quite strongly. As a proxy for this demand we used the ratio of foreign direct investment to GDP, which, however, like the interest rate, was available only for the Czech Republic as a whole.

Demand for property can also be affected by market rents, growth of which tends to lead to rising apartment prices. This factor reflects substitution between renting and home ownership, as rising rents motivate households to buy a flat of their own. The level of rents also affects investment in housing for speculative reasons, as growth in rents *ceteris paribus* increases the returns on such investment and leads to rising demand for apartments.[21]

Table 1 – Descriptive statistics (figures for average region; annual data for 1998–2007)

	Variable	Unit	Mean	Median	Variability over time (%)	Variability across regions (%)
	Apartment prices	CZK/m²	14,079	13,509	30.1	36.3
Supply factors	Building plot prices	CZK/m²	1,410	1,109	20.7	69.7
	Apartment construction prices	CZK/m²	26,403	26,139	8.3	10.2
	Completed apartments	% of hous. stock	0.34	0.31	28.8	49.4
	No. of apartments per 1,000 inhabitants	number	378	376	2.1	5.0

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21 The dependence between apartment prices and market rents can go in either direction, of course. The aforementioned substitution between rents and home ownership may therefore mean that, conversely, a rise in apartment prices will lead to a rise in market rents (home ownership will become less affordable, causing demand for rented accommodation to rise). Besides that, one needs to take into account the decisions of owners of rental properties as to whether to continue renting the property or whether to sell it (as happened in the past with many municipal flats with regulated rents). Given the limited length of the time series, however, we do not examine the direction of the causality between apartment prices and other variables in our analysis.

Table 1 – Descriptive statistics (figures for average region; annual data for 1998–2007) – continued

	Variable	Unit	Mean	Median	Variability over time (%)	Variability across regions (%)
Demand factors	Marriages	% of MYP	0.545	0.542	0.053	0.068
	Divorces	% of MYP	0.324	0.327	0.122	0.138
	Natural population growth	% of MYP	-8.9	-10.2	211.2	87.2
	Net migration	% of MYP	15.2	3.9	210.6	5,207.5
	Unemployment rate	%	7.4	6.7	16.4	38.5
	Economic activity rate of population	%	59.9	59.7	1.5	2.3
	Vacancies/labour force	%	0.98	0.86	42.8	30.4
	Average monthly wage	CZK	15,080	14,847	18.9	10.7
	Rent per month	CZK/m^2	84.8	83.1	17.9	27.2
	Loans	CZK millions	15,312	8,031	87.6	107.7

Source: CZSO, CNB, IRI
Notes: Variability computed as standard deviation in % of mean.
          MYP denotes mid-year population.

For some of the aforementioned explanatory variables we can expect strong endogeneity within the model of apartment prices, which may be due to causality in the opposite direction. For example, the aforementioned substitution between rents and home ownership may run in either direction (i.e. a rise in apartment prices may lead to upward pressure on rents), higher prices may lead to greater housing construction, and so on. In addition, a common factor may be acting on some explanatory variables, one which is unobserved and which might be the cause of a bubble. For instance, irrational and self-fulfilling expectations regarding future price growth will very probably give rise to a bubble both on the housing market and on the land and rental markets. If we include these variables in the apartment price model, the estimated price bubble will be smaller than in reality. For this reason, we computed all the regressions in two variants – one in which all the variables are included (estimate A) and one in which we discarded the variables with the highest probability of endogeneity (estimate B).

3. RESULTS

The empirical analysis was conducted by means of (i) aggregate regression analysis of time series for the Czech Republic and Prague on quarterly data for the period January 1998–September 2008, and (ii) panel regression across the Czech regions (including and excluding Prague) on annual data for 1998–2007. The explained variable was apartment price growth (aggregate regression) or the apartment price level (panel regression), in nominal terms in both cases. The explanatory variables used are listed in Table 1. In both empirical calculations we work with unlagged exogenous variables (owing to the short length of the time series used). In both analyses we also conducted an estimate based on a narrower set of explanatory variables owing to the possible existence of interlinkages. By comparing them we will also get some idea of the stability and robustness of our results.

3.1 Time series analysis for the Czech Republic and Prague

The results of the regression analysis for Prague and the Czech Republic as a whole (see Table 2) show that the apartment price growth can be explained mainly by rising prices of land and rising rents. A weak effect is also observed for the ratio of foreign direct investment to GDP. The growth in apartment prices in Prague can also be explained by movements in unemployment. In the case of the Czech Republic, net migration was another significant factor, along with natural population growth and partly also the marriage rate in the case of the narrower estimate. The other variables used were not significant at the required level of significance. This can be interpreted as meaning that the evolution of apartment prices over time cannot be explained by the majority of demographic and other macroeconomic time series.[22]

Table 2 – Results of regression for Prague and the Czech Republic

Variable	CZ – Estimate A		CZ – Estimate B		Prague – Estimate B	
Apartment prices [a]	Coefficient	Std. dev. [b]	Coefficient	Std. dev. [b]	Coefficient	Std. dev. [b]
Land prices [a]	0.665*	0.342	-	-	-	-
Construction output price index [a]	0.256	1.475	-1.127	1.102	1.155	2.286
Completed apartments [a,c]	0.026	0.028	0.091*	0.048	0.088**	0.041
No. of apartments per 1,000 inhabitants	0.000	0.001	0.001	0.002	0.000	0.001
Marriages [c]	0.483	0.487	0.830*	0.441	0.129	0.604
Divorces	-0.064	0.387	0.010	0.468	0.219	0.622
Natural population growth [c]	-0.408	0.529	-0.695*	0.381	-0.633**	0.296
Net migration	0.105**	0.055	-0.001	0.066	-0.025	0.024
Unemployment rate	-0.006	0.005	-0.007	0.006	-0.049***	0.017
Economic activity	-0.001	0.007	-0.007	0.015	-0.001	0.007
Vacancies/labour force	0.036	0.069	0.113	0.070	0.005	0.046
Average monthly wage [a,c]	0.370	0.268	0.441	0.268	0.197	0.273
Rent per month [a]	0.344*	0.203	-	-	-	-
Loans [a]	-0.037	0.066	-0.065	0.081	0.091	0.139
1Y PRIBOR	-0.002	0.002	-0.002	0.004	-0.006	0.004
Ratio of FDI to GDP	0.0034**	0.001	0.0034*	0.0018	0.0032*	0.0018
Adjusted R²	0.48		0.20		0.15	
Durbin-Watson statistic	1.64		1.23		1.56	

Source: CZSO, CNB, IRI
Note   significant at ***1%, **5% and *10% level of significance
        [a] differences, [b] Newey-West HAC standard deviations, [c] seasonally adjusted

The above estimate A for the Czech Republic[23] can be used to broadly identify periods when property prices were overvalued and also to identify the magnitude of such overvaluation. The estimates of equilibrium property prices and the gaps between actual and equilibrium property prices are shown in Charts 1 and 2. These estimates were then compared with the "naive" equilibrium estimate obtained by applying the Hodrick-Prescott (HP) filter.

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22 Tests of the residuals ruled out the occurrence of autocorrelation and non-normality at the usual level of significance. Moreover, tests of the stability of the coefficients by recursive estimation demonstrated relatively satisfactory stability.

23 As our regression estimates the equilibrium quarter-on-quarter growth in property prices, the equilibrium absolute prices were computed from the estimated quarter-on-quarter increases.

Like the HP filter, our regression identifies two possible periods of property price overvaluation (bubbles), namely the start of 2003 and late 2007/early 2008. The one-quarter to one-half level of overvaluation resulting from the model compared to the HP filter is not surprising.[24] One interesting conclusion, however, is that although it may seem from the simple view using the HP filter that the degree of absolute overvaluation of prices was roughly the same in these two periods, our estimated regression identifies roughly half the level of overvaluation for 2007–2008 compared to 2002, which is not all that significant from the statistical perspective.[25] This outcome reflects the fact that the growth in prices in 2002/2003 was driven mainly by speculation linked with the Czech Republic's accession to the EU, whereas the recent surge in 2007/2008 is due primarily to improved fundamentals (wage growth, higher population growth, lower unemployment, etc.).[26]

CHART 1 – Apartment prices in the Czech Republic
(CZK thousands per m²)
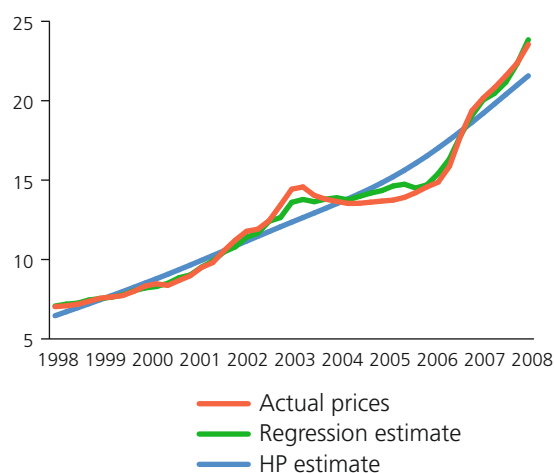
CHART 2 – Gap in prices in the Czech Republic –
deviation of actual prices from estimate
in CZK thousands per m²
(dashed lines indicate 10% confidence interval)

Actual prices
Regression estimate
HP estimate

Source: CZSO, CNB calculation

Regression gap
HP filter gap
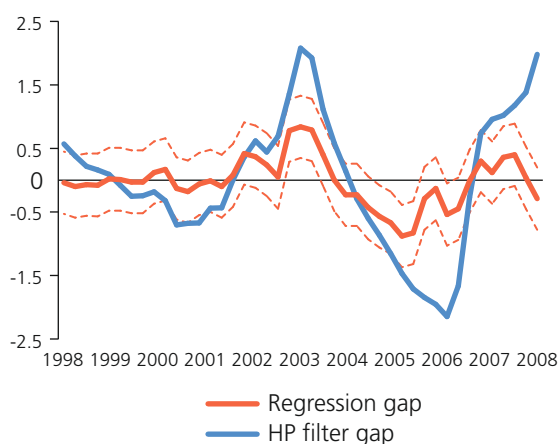
Source: CZSO, CNB calculation

Note: positive values overvaluation, negative values undervaluation; dashed lines indicate 10% confidence interval

3.2 The Czech Republic by regions

In order to capture analytically the aforementioned heterogeneity of houses as an asset at least partially, we estimated a panel regression for apartment prices covering the individual Czech regions.[27] The results are summarised in Tables 3 and 4.

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24 The fact that the regression-based estimate fits the actual data more closely than the HP filter is due to the additional effect of a relatively high number of explanatory variables. When the version of the model with endogenous variables excluded is used, the result lies somewhere between the HP filter and the model containing all the explanatory variables in Table 1.

25 When the overvaluations are expressed in percentages of property prices, the regression identifies overvaluations of around 6.3% at the start of 2003 and around 2.4% at the start of 2008, whereas the HP filter identifies overvaluations of roughly 12% and 7% respectively for the same periods.

26 This outcome is also linked with the nature of the data, i.e. with the different cyclical component in the individual variables in the regression, which to some extent prevents a bubble from manifesting itself.

27 The statistical tests indicated that it was appropriate to use a panel regression with fixed effects. We tested the panel data for non-stationarity using the Hadri panel unit root test, which tests for stationarity in so-called heterogeneous panels.

To capture the differences in property prices between regions, we used absolute prices in CZK per m².[28] However, to eliminate non-stationarity of the residuals, we had to incorporate apartment prices lagged by one year into the regression. Not surprisingly, they turned out to be statistically significant, indicating some persistence in apartment prices.[29]

The panel regression results also showed that cost effects are not a significant factor of apartment price growth. The effect of a rise in building land prices had the correct positive sign, but was insignificant. In the case of land prices, one can also, of course, discuss the direction of the implication between apartment prices and building land prices, or their substitutive relationship as assets to apartment prices. The regression implicitly considers this cost effect, as higher land prices lead to higher costs of new apartment construction and higher prices of new apartments. However, one can also consider the opposite effect where high apartment prices lead to more intensive apartment construction, reflected, in turn, in higher demand for building land, which, given its low price elasticity, leads to rising prices of land. The second component of apartment-building costs, "apartment construction prices"[30], which reflect the costs of building, also turned out to be insignificant and even had the opposite sign than expected. This is probably because this price shows little variability between regions or over time.

Of the other supply factors, the number of apartments per 1,000 inhabitants also proved significant, drowning out the number of newly completed apartments. The number of apartments had the opposite sign than expected (higher housing saturation should lead, ceteris paribus, to lower prices). The explanation here may again be the opposite implication, with higher apartment prices – given relatively stable construction costs across regions – leading to higher apartment construction and, in turn, to a higher number of apartments. However, when Prague is excluded from the dataset (see the Prague specifics described below) this variable turns out to be statistically insignificant.

Of the demographic factors, the divorce rate proved significant. The sign on it is consistent with intuition, as a higher divorce rate leads to a greater need for housing (a divorce usually gives rise to a new household). A similar effect can be expected for the marriage rate, although it turned out to be statistically insignificant. As for population growth, net migration was significant. Its higher statistical significance compared to natural population growth is quite logical. In the case of higher natural population growth, due to a higher birth rate, the "new inhabitants" mostly enter existing households, whereas migration more often gives rise to a new household and hence a new need for an apartment. The statistically insignificant effect of natural population growth was in fact opposite to what was expected, which may again be explained by the fact that higher availability of housing (i.e. lower apartment prices) may conversely motivate young couples to have larger families. The variables relating to the labour market (unemployment, economic activity, number of vacancies) also proved to be statistically insignificant. This may reflect the generally low labour mobility within the Czech Republic, as relatively few people move in search of work and labour market imbalances tend to be resolved by commuting or by the employment of foreign casual workers, whose demand for home ownership is low. The highest statistical significance (bordering on the 15% level), and also the logical sign, was recorded by the unemployment rate.

Of the other demand factors, growth in market rent proved significant, reflecting substitution between renting and home ownership. The significance of the coefficient meanwhile confirms the role of the price-to-rent ratio as an important indicator of the stability of apartment price growth. The significance of the price-to-wage ratio was also confirmed, as the coefficient on wage growth was significant at the 1% level with the expected sign. The expected role of housing loans as a major demand mechanism of property price growth was also confirmed.

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28 The use of absolute prices, however, precludes a simple comparison of the magnitudes of the resulting coefficients between Tables 2 and 3. In the first case the coefficients reflect the impact on price growth, whereas in the second they reflect the impacts on the price level. Moreover, the significance of the coefficients from the panel regression may differ from the results of the regression in section 3.1. Some of the variables may have insufficient variability over time (and so cannot explain the growth in prices) but sufficient variability across regions (which may lead to them being significant in the panel regression).

29 The estimated coefficient here is less than one, so the estimated relation should converge.

30 "Construction prices" mean the total projected construction investment costs (at least the amount stated the planning permission application documents, i.e. the tentative costs of the build, including equipment). The total acquisition amount does not include the cost of land. See CZSO (2008).

Of the variables that were used for all regions the same, only the interest rate turned out to be statistically significant, although unfortunately it had the opposite sign than expected. This deviation may have arisen because we used the interest rate on the interbank market, whereas interest rates on new housing loans would have been economically more meaningful (and the spread between these two rates can change quite significantly over time). Unfortunately, however, we did not have housing loan rates available for the whole time period (figures are only available from 2004 onwards).

Table 3 – Results of panel regression by Czech regions

Variable	CZ – Estimate A		CZ – Estimate B		CZ excl. Prague – Estimate B	
Apartment prices	Coefficient	Std. dev.	Coefficient	Std. dev.	Coefficient	Std. dev.
Apartment prices [a]	0.850***	0.207	0.570***	0.122	0.619***	0.144
Land prices [b]	0.437	0.726	-	-	-	-
Apartment construction prices [b]	-0.024	0.063	-0.031	0.084	-0.046	0.091
Completed apartments	-3,010	126,118	65,557	133,028	13,130	121,986
No. of apartments per 1,000 inhabitants	107.9*	66.0	100.7*	52.4	79.91	67.77
Marriages	-133.7	4,362	-1,748	5,503	-4,831	5,991
Divorces	5,795**	2,853	5,408	4,505	3,868	4,475
Natural population growth	-1,160	2,659	-4,201	2,787	-4,843	2,951
Net migration	1,333***	478.5	1,729***	480.0	1,422***	486.3
Unemployment rate	-200.8	142.7	-349.6**	147.6	-216.2	159.9
Economic activity rate of population	28.54	223.5	73.6	275.4	30.79	294.2
Vacancies/labour force	-3.85	6.37	7.03	5.83	3.61	6.24
Average monthly wage [b]	2.749***	0.958	3.402***	1.001	3.251**	1.139
Rent per month [b]	109.9***	26.9	-	-	-	-
Loans [b]	0.0778*	0.050	0.093**	0.046	0.365***	0.121
1Y PRIBOR	439**	204.8	27.64	232.69	210.9	241.0
Ratio of FDI to GDP	-6,100	4,569	-6,121	5,636	-4,146	5,993
Durbin-Watson statistics	1.64		1.23		1.56	

Source: CZSO, CNB, IRI
Note: significant at ***1%, **5% and *10% level of significance
        [a] variable lagged by 1Q, [b] differences

The overall statistical properties of the panel regression seem fairly good (see Table 4). We succeeded in explaining the variability of prices across regions better than their variability over time, but the difference was not large. The statistics confirm the appropriateness of using the fixed effects model. The F-test of equality of the constants for fixed effects rejects the hypothesis of equality at the 7% level of significance, which at least partly confirms the hypothesis that some regions are specific in nature. For example, one can assume that apartment prices in Prague are, *ceteris paribus*, higher than in other regions, because Prague is the capital city. The specific nature of property prices in Prague is confirmed by Chart 3, which compares the residuals of the panel regression by regions with prices in those regions. This chart shows that it generally holds that apartment prices in regions with lower prices are undervalued (negative residuals), whereas those in regions with higher prices are somewhat overvalued (positive residuals). But in Prague (labelled A in the chart), apartment prices diverge from this positive relationship between the price and the degree of overvaluation, recording an absolute undervaluation despite

being the highest of all.[31] This undervaluation, however, may be partly due to the properties of the estimation technique. If prices in Prague were systematically higher than in the rest of the Czech Republic in the past (as the data show), the panel regression will assign them the highest fixed effect in absolute terms compared to the other regions. This may mean that the conclusion that apartment prices in Prague are undervalued is based on explanatory variables which are not necessary equilibrium variables themselves. For illustration, there are roughly 14% more houses per 1,000 inhabitants in Prague compared to the average region, while wages are 38% higher, unemployment is around 50% lower, net migration is 4.5 times higher and lending for housing purposes per person is roughly 2.5 times higher. Given the still relatively short length of the available time series, there is thus a question as to whether the resulting "undervaluation" is in fact real. The conclusion that apartment prices in Prague are undervalued compared to the other Czech regions is also inconsistent with the comparison of the price-to-income and price-to-rent ratios between regions, which indicates that Prague is, on the contrary, the highest-risk region (see Box 6 Identifying property market bubbles in CNB, 2007).

CHART 3 – Apartment price overvaluation relative to apartment price (average residual for 1998–2007)

Table 4 – Results of panel regression by Czech regions – statistics

Statistic	Value	Statistic	Value
No. of observations	117	No. of groups (regions)	13
R^2 – within (between regions)	0.947	R^2 – between (over time)	0.893
R^2 – overall	0.896	rho	0.842
$F_{(17, 87)}$	167.82	Prob > F	0.000
F test of equality of constants for regions (FE)			
$F_{(12, 87)}$	1.73	Prob > F	0.073
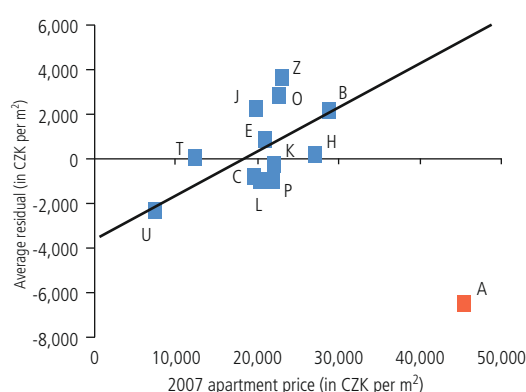
Source: CZSO, IRI, CNB, CNB calculation
Note: Region abbreviations given in abbreviations list

4. CONCLUSIONS

In this article we focused on analysing property price determinants using two simple econometric models. To the best of our knowledge, this is the first such application of econometric techniques to property prices in the Czech Republic. For this reason, and also because of difficulties associated with the properties of the analytical methods applied and with the relatively short time series used, the results of the analysis should be interpreted with caution. That said, a number of conclusions can be drawn. Of the demographic factors, both regressions confirmed a positive effect of net migration on property prices. The divorce rate also seems to be important. The effects of cost factors were mixed: the time series analysis results showed land prices to be significant, while in the panel regression cost factors tended to be insignificant or even contrary to economic intuition (the number of apartments per 1,000 inhabitants). The unemployment rate and wage growth turned out to be significant among the labour market-related demand factors, as did credit growth among the other factors.

One interesting result is the identification of periods when property prices were overvalued. As expected, the model identified property price bubbles in 2002/2003 and 2007/2008. Rather surprisingly, however, the level of overvaluation in 2007/2008 was significantly lower than in the first period, even though the increases

31 In relative terms the price undervaluation in Prague (A) is second highest behind Ústí nad Labem (U).

in prices in the two periods were similar. Much of the recent rise in prices can be explained by fundamentals and the bubble is not as large as it might appear at first glance. Given the impacts of the financial crisis on the Czech economy, however, renewed inflation of the bubble "from below" via worsening fundamentals cannot be ruled out entirely unless property prices fall in absolute terms.

Looking at the individual regions, one quite surprising result is that the level of overvaluation of apartment prices in individual regions is positively related to the apartment price level (in regions where apartment prices are higher, they are also more likely to be overvalued). Apartment prices in Prague are the exception to this rule, recording the greatest absolute undervaluation. This undervaluation is probably due partly to the properties of the estimation technique, as the conclusion that apartment prices in Prague are undervalued may be based on explanatory variables which are not necessarily equilibrium variables themselves. This outcome is therefore not wholly consistent with earlier simple analyses. It may be due to the properties of the estimation technique and may thus not be entirely robust. However, it confirms that the property market in Prague is specific in nature compared to the other Czech regions. This type of analysis will be further systematically refined, as it forms an integral part of central banks' financial stability map.

REFERENCES

BORDO, M., JEANNE, O. (2002): *Boom–busts in Asset Prices, Economic Instability, and Monetary Policy,* NBER Working Paper 8966.

BORIO, C., LOWE, P. (2002): *Asset Prices, Financial and Monetary Stability: Exploring the Nexus*, BIS Working Papers 114.

CNB (2007): Financial Stability Report 2007: Box 6 *Identifying property market bubbles.* Czech National Bank.

CZECH STATISTICAL OFFICE (2008): *Analýza bytové výstavby v roce 2007* (Analysis of Apartment Construction in 2007).

ÉGERT, B., MIHALJEK, D. (2008): *Determinants of House Prices in Central and Eastern Europe*, Working Paper No. 1/2008, Czech National Bank.

FRAIT, J., KOMÁREK, L. (2007): *Monetary Policy and Asset Prices: What Role for Central Banks in New EU Member States?* Prague Economic Papers, Vol. XVI, No. 1, March 2007.

HELBLING, T., TERRONES, M. (2003a): *Real and Financial Effects of Bursting Asset Price Bubbles*, in: World Economic Outlook April 2003 (Washington: International Monetary Fund).

HELBLING, T., TERRONES, M. (2003b): *Asset Price Booms and Busts—Stylized Facts from the Last Three Decades of the 20th Century*, paper presented at a European Central Bank workshop entitled "Asset Prices and Monetary Policy", Frankfurt, 11–12 December.

HM TREASURY (2003): *Housing, Consumption and EMU*, London: HM Treasury. www.hm-treasury.gov.uk.

POSEN, A. (2006): *Why Central Banks Should Not Burst Bubbles*, International Finance, Vol. 9, Issue 1, pp. 109–124.

POTERBA, J. M. (1984): *Tax Subsidies to Owner-occupied Housing: An Asset Market Approach,* The Quarterly Journal of Economics, Vol. 99, No. 4, pp. 729–752.

ROUBINI, N. (2006): *Why Central Banks Should Burst Bubbles*, International Finance, Vol. 9, Issue 1, pp. 87–107.

MODELS OF BANK FINANCING OF CZECH CORPORATIONS AND CREDIT RISK

Adam Geršl and Petr Jakubík

This article presents the results of an analysis of data on individual bank loans of non-financial corporations in the Czech Republic taken from the CNB's Central Register of Credits. It focuses on the question of how firms obtain financing from domestic banks. The results show that the vast majority of non-financial corporations use the services of just one relationship lender. Small and young firms in technology- and knowledge-intensive industries tend to concentrate their credit needs in a single bank, whereas less creditworthy firms and firms in cyclical industries tend to borrow from more than one bank. It also turns out that the level of credit risk at bank level decreases in line with the extent to which firms applying single relationship banking occur in the bank's portfolio.

1. INTRODUCTION

The global financial crisis that erupted in summer 2007 has raised concerns about how banks trying to maintain sensible solvency and liquidity values will respond in their traditional portfolios, i.e. primarily in the segment of lending to non-financial clients. The signals so far suggest that banks have responded vis-à-vis their customers by tightening all three dimensions of their financial conditions, i.e. the volume of loans (or new loans), the interest conditions (higher interest rates) and the non-interest conditions (the collateral required and the proportion of project self-financing). From firms' perspective, the situation may thus be highly unfavourable, as the critical situation in the financial markets coupled with high risk aversion reduces the opportunities for market financing using market instruments (bonds, equities and other securities). At times of financial turbulence, bank financing thus becomes the primary source of external finance again, giving banks a relatively strong position in determining the financial conditions.

The financial conditions can also be affected by whether a firm borrows from just one relationship lender or whether it obtains financing from multiple banks. Relationship banking is most often cited as a phenomenon of the German banking system, but the available evidence suggests that this model is also relevant to other economies, including the Czech Republic. An important question is whether this bank financing model is beneficial to the firm at a time of economic crisis.

This article sets out to determine which bank financing model predominates in the Czech Republic, what its main characteristics are, and what factors the choice of bank financing model depends on at firm level. We also analyse whether the model chosen has a significant effect on the credit risk of relationship lenders.

This article uses internal data from the database of the CNB's Central Register of Credits (CRC), which since 2002 has been recording all new credit relationships between companies and banks in the Czech Republic. These data have not previously been used for analytical purposes, so this article represents the first research study drawing on this original source of data.

Section 2 presents the CRC data used, while section 3 contains numerous descriptive statistics regarding the model of bank financing of firms in the Czech Republic. Section 4 analyses the determinants of the choice of the number of lending relationships at firm level, and section 5 tests the effect of the application of relationship banking on the credit risk of banks. Section 6 concludes.

2. DATA

The CNB's Central Register of Credits contains all the balance sheet exposures of domestic banks (including branches of foreign banks) to resident and non-resident legal entities and to sole traders and has been maintained since the end of 2002. Anonymised data on the loans of non-financial corporations were used for the analysis. Loans to non-residents, sole traders, the public sector and financial institutions were not taken into

account. In all, the sample contained almost 8 million records describing the loans of around 120,000 companies in the period from December 2002 to December 2008.

For each firm, in addition to their main characteristics, we constructed variables describing the number of lending relationships, debits/overdrafts as a percentage of total debt, FX loans as a percentage of total bank loans, the year of the oldest granted loan, the firm's "age" (computed as the difference between the year of the observation and the year of the oldest granted loan) and client creditworthiness (using information on the default rate in previous years). For each firm, we also created variables relating to the three most important lenders (in terms of the banks' share in the firm's total borrowings from domestic banks), namely the amount of the share, selected data on the bank and selected data on the credit relationship with that bank, i.e. the above mentioned characteristics of the relationship (debt and foreign currency ratios, year of oldest loan and information on default).

Finally, we created variables at individual bank level, i.e. the 12M default rate in the corporate loan portfolio[32], the bank's market share in total loans to non-financial corporations, and the shares of various types of debtors and selected sectors and loans in the total corporate loan portfolio (foreign currencies, foreign-controlled corporations, small and medium-sized enterprises, etc.).

3. MODEL OF BANK FINANCING OF FIRMS IN THE CZECH REPUBLIC

Relationship banking may be the optimal financial strategy for many companies, as a relationship lender has a good knowledge of the firm's credit history and performance and can react optimally to its evolving financing needs. From the bank's perspective, relationship banking may be an attractive business strategy, since it maximises the benefits while minimising the necessary borrower monitoring costs. This reduces the main problem of banking business, namely the information asymmetry between borrower and lender. "Service packages" for businesses and "customised financing" are indeed a manifestation of a business model that focuses on a single bank winning a client and financing all its needs.

According to the conclusions of previous studies, company characteristics and competition are important determinants of the bank-customer relationship (Petersen and Rajan, 1994; Nam, 2004; Elsas, 2005). These studies also reveal that companies with a relationship lender have easier access to loan financing (Elsas and Krahnen, 1998; Harhoff and Körting, 1998), although an effect on interest conditions has not been unambiguously proved (Stein et al. 2007; Elsas and Krahnen, 1998; Harhoff and Körting, 1998; Gorton and Schmid, 1996).

It is relevant to ask whether relationship banking is beneficial to the firm during a recession. This would be true if the above arguments concerning easier access to financing apply even at times of financial distress. One counter-argument is that the consequences of cancelling a line of credit to a company may be greater in the case of relationship banking, because the company has no credit history with any other bank and so its chances of raising alternative bank financing under reasonable interest conditions are reduced.

Petersen and Rajan (1994) define relationship banking as a situation where there are close ties between the firm and the lender. The usual indicator of this model is the number of lenders, with the existence of just one bank corresponding to relationship banking. However, for large firms, which often use the services of multiple banks, this indicator is too restrictive. Even if it uses multiple banks, the firm may have a truly close, tight and long-term relationship with just one lender. The existing literature offers three main indicators of close ties: (a) the number of lending relationships, (b) the share of the most significant bank in the company's total debt, and (c) the duration of the main lending relationship (Ongena and Smith 2001; Memmel et al. 2007). The share of the most important bank turns out to be the indicator with the highest information value for close ties between a company and a bank (Elsas, 2005).

32 The 12M default rate was computed as the proportion of the bank's claims that will fall into the category "in default for more than 90 days" within 12 months.

For the purposes of this article we use only the first two indicators, i.e. the number of lending relationships and the share of the most significant bank. For the latter, we additionally construct a dummy variable taking the value of 1 when the share of the main bank is more than 80%. In the text that follows, "single relationship banking" refers to the situation where a firm borrows from a single bank. The situation where one bank has a dominant share in a company's borrowings (more than 80%) we term "dominant relationship banking".

The analysed data on the number of lending relationships reveal that relationship banking predominates in the Czech Republic. At the end of 2008, 85% of all non-financial corporations had just one lender, 12% had two and only around 3% had three or more (see Chart 1). Over the past six years, however, single relationship banking has been declining in significance, as almost 90% of companies were applying this model in 2002.

It is interesting to compare this figure with Germany, which is considered by theoreticians and practicians alike to be the classic example of single relationship banking (the Hausbank model). In a study based on the Deutsche Bundesbank credit register, Memmel et al. (2007) state that only around 45% of companies apply single relationship banking (see Table 1). A comparison of the distribution of the number of lending relationships between the Czech Republic and Germany reveals that German firms use the services of multiple banks to a far greater extent.[33] This difference may be partly due to the different relative size of corporations and banks. Germany has far more large enterprises and small regional banks, so consortium financing is the only option for many large companies.[34]

Chart 1 – Proportion of companies with given number of lending relationships
(% of total number of companies in given period)

One lending relationship (left-hand scale)
Two lending relationships (right-hand scale)
Three or more lending relationships (right-hand scale)
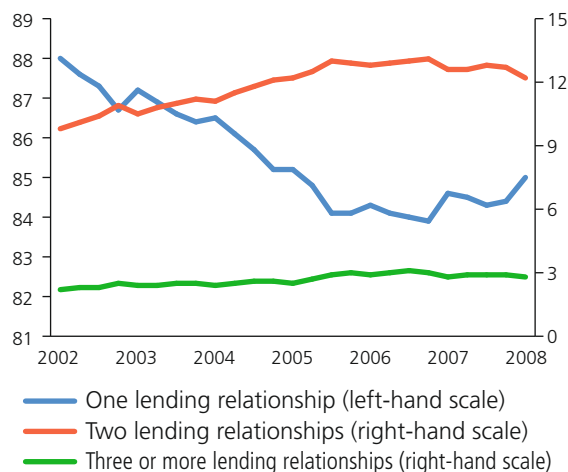
Source: CNB (CRC), authors' calculations

Table 1 – Comparison of distribution of number of lending relationships between Czech Rep. and Germany

No. of lending relationships	in % of all companies		
	CZ (2008)	CZ (2002)	Germany (2002)
1	85.0	88.0	43.5
2	12.2	9.8	23.2
3	2.2	1.7	11.4
4	0.4	0.4	5.8
5	0,1	0.1	3.8
6	0.0	0.0	3.3
7	0.0	0.0	2.1
8	0.0	0.0	1.4
9	0.0	0.0	1.1
10+	0.0	0.0	4.3

Source: CNB (CRC), authors' calculations; Memmel et al. (2007)

In the other indicator of single relationship banking, i.e. the share of the most important bank in a company's total bank debt, the proportion of companies applying dominant relationship banking is of course even higher (see Chart 2). But this indicator is declining over time as well. In Germany, the figure is somewhere between 50% and 60% (Schmieder et al., 2008). For the Czech Republic, the mean share of the most important bank is almost 97%, which is, of course, due to the high proportion of firms with a single relationship lender, with a range of 14% to 100%. Stein et al. (2007) report an average for this indicator of around 60% (with a minimum of 9% and a maximum of 100%).

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33 Memmel et al. (2007) report a maximum value for the variable "number of lending relationships" of 197. In the Czech Republic the maximum number is 11.

34 This reason is supported by the fact that the data used for the analysis of Germany in Memmel et al. (2007) come from the Deutsche Bundesbank credit register, which only contains loans that exceed EUR 1.5m, i.e. loans primarily to large corporations.

Given that single relationship banking prevails among Czech firms, it is not surprising that large banks dominate as single relationship lenders (see Chart 3). Roughly 70% of companies with single relationship lenders choose a large bank as their only bank, while around 20% choose a medium-sized bank. The role of branches of foreign banks and small banks is limited in this regard.[35]

Chart 2 – Proportion of companies applying dominant relationship banking
(% of total number of companies in given period)
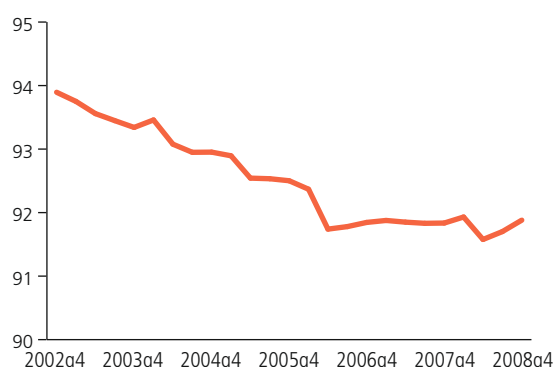
Source: CNB (CRC), authors' calculations

Chart 3 – Single relationship lenders by bank category (percentage of companies with single relationship lender from given category)
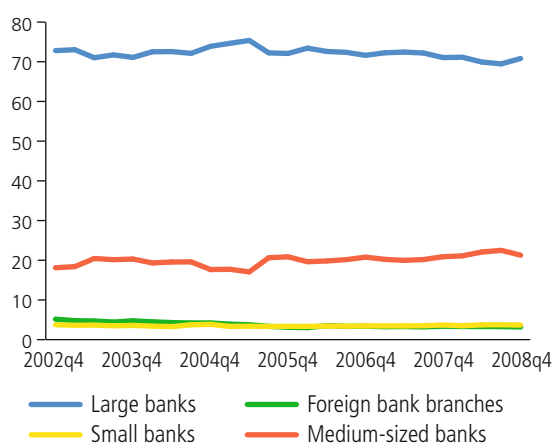
Source: CNB (CRC), authors' calculations
Note: The chart does not contain building societies, whose role as single relationship lenders is minimal.

The data offer more interesting information on which first and second most important banks are chosen by firms using multiple banks. The role of foreign bank branches, for instance, could be greater here, since these banks offer companies certain specialised services. The average share of the first most important bank (for firms that have more than one relationship lender) in the total debt of the firm is 77% and the share of the second relationship lender is 20%. Table 2 shows the distribution of firms with two relationship lenders by the group of the first and second relationship lender. It turns out that large banks also have the largest share in the role of second bank, including for firms that already have a large bank as their first lender.

As the lending services offered to firms by all the large banks are broadly similar, firms may opt for the "large–large" combination as a strategy for avoiding the problem of being "captured" by one relationship lender (Schmieder et al. 2008). Memmel et al. (2008) show on German data that firms applying single or dominant relationship banking reduce their share with the largest bank in favour of another bank over time as they grow. The firm's bargaining position as regards lending conditions thus improves over time, as its credit history is known to more than one bank.

Table 2 also shows that the second most common combination of relationship lenders is large–medium-sized or medium-sized–large (with a very similar number of firms), followed by foreign bank branch–large (or large–branch). In these cases, a greater role is probably played by the firm's specific requirements, geographical location (accessibility of the bank), efforts made by banks to target specific clients and, for foreign-controlled corporations, existing ties between the firm's owners and the bank.

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35 The role of medium-sized banks was not significantly reduced by the change of form of Citibank from a medium-sized bank to a branch of a foreign bank in 2008.

For the sake of completeness, we should mention that for firms using the services of three or more banks, large banks again play the most important role, followed by medium-sized banks and foreign bank branches. The most common bank combination for these firms is thus large–large–large. The factors here may include the firm's size (the need for syndicated financing in large firms) and the strategy of avoiding capture and cutting financing costs, although historical ties may also play a role. The largest banks were all to some extent specialised in the past decade, so companies used the services of large banks for different purposes (payments, investment vs. operating vs. export financing, etc.). Owing to the conservative nature of large domestic firms, these ties apparently still survive, even though these banks now operate essentially as universal banks offering practically every banking service.

Table 2 – Distribution of relationship lenders by bank group for firms with two relationship lenders (% of total number of companies for all periods)

First relationship lender	Second relationship lender			
	Large banks	**Medium-sized banks**	**Small banks**	**Foreign bank branches**
Large banks	35.2	19.1	2.3	5.4
Medium-sized banks	19.1	3.3	0.7	1.7
Small banks	2.2	0.7	0.1	0.3
Foreign bank branches	6.8	1.9	0.4	0.5

Source: CNB (CRC), authors' calculations

Table 3 – Differences in behaviour towards various relationship lenders (average indicators in %)

Share of overdrafts and debit balances in bank debt

	One relation-ship	Two relationship lenders			Three or more relationship lenders			
		Total	1st bank	2nd bank	Total	1st bank	2nd bank	3rd bank
2002	44.6	27.9	27.9	41.2	13.1	11.8	20.3	28.4
2005	57.9	42.7	41.6	56.0	30.2	27.8	35.3	44.5
2008	46.5	37.3	35.7	53.4	32.3	30.8	38.0	49.0

Share of foreign currency loans in bank debt

	One relation-ship	Two relationship lenders			Three or more relationship lenders			
		Total	1st bank	2nd bank	Total	1st bank	2nd bank	3rd bank
2002	8.8	8.0	7.8	8.8	11.4	11.9	11.0	15.4
2005	5.4	3.3	3.2	4.6	6.0	6.1	5.9	6.3
2008	3.5	2.7	2.8	3.2	4.3	4.4	4.3	6.0

Source: CNB (CRC), authors' calculations

The CRC contains information on whether a company borrows in the form of an overdraft or debit balance. This is an indirect indicator that the firm also has a current account with a particular bank and that it therefore uses the bank for routine payments with other trading partners. The data reveal that firms applying dominant relationship banking have a higher share of overdrafts and debit balances in their total bank debt than companies that do not apply this model (50% versus 36% of total bank debt). This may be linked with company size, since dominant relationship banking is applied more by small firms (see below). They usually have more volatile revenues, as they have a smaller number of clients, and so they are forced to use overdraft or debit facilities more often for their day-to-day operations.

For firms using multiple banks, detailed data on their lending relationships allow us to analyse whether firms behave differently towards different banks. In the case of overdrafts and debit balances, it turns out that firms obtain overdrafts from their main bank to a lesser extent than from other banks in the sequence (see Table 3). One of the reasons may be that second and subsequent relationship lenders finance companies' other needs (in particular operations), in which overdrafts naturally have a greater weight. Moreover, firms may behave more cautiously towards their main bank in the overdraft area and probably do not make full use of overdraft or debit facilities. This behaviour has not changed significantly over time, even though the rate of overdraft use has changed.

Similar behaviour can be observed for the share of FX loans. The average share of FX loans in firms' total bank debt has steadily decreased from around 9% in 2002 to 3.5% in 2008.[36] This share differs little between firms applying dominant relationship banking and other firms, but firms with three or more banks have a higher share of FX loans than firms with two relationship lenders (see Table 3). These tend to be larger firms with a strong export orientation. It also turns out that in the case of multiple bank financing the share of FX loans is usually higher for more distant banks. This is to some extent consistent with the finding that foreign bank branches, which specialise in providing FX loans or financing international trading, tend to occupy second or third place in the order of financing importance.

The final issue in the area of firms' different behaviour towards different banks is their strategy in the event of repayment difficulties. An analysis of the data reveals that firms with two relationship lenders tend to default with their main bank (on average almost 50% of firms with repayment difficulties) and keep up their repayments with the second bank. A further 30% of firms stop repaying both banks simultaneously.[37] At first glance, this situation contrasts with the conclusions of the analysis of behaviour in the area of debit balances and overdrafts, where firms try to maintain a good credit history with their main bank. A more detailed analysis reveals, however, that firms defaulting primarily with their main bank likewise use overdraft and debit facilities with them to a greater extent. In the case of three or more relationship lenders, the situation is heterogeneous and no dominant model of behaviour can be identified. In percentage terms, the most frequently observed phenomenon is default with all three relationship lenders (around 22% of cases), followed by default with the first two banks (20% of cases) and default with the first bank (16% of cases).

4. ANALYSIS OF THE DETERMINANTS OF THE CHOICE OF SINGLE RELATIONSHIP BANKING

Empirical studies analysing the determinants of the choice of bank financing model by individual firms (Memmel et al., 2007) find a particularly important role for the size, age and creditworthiness of the firm, the technology and knowledge intensity and cyclicality of the industry, and the type and size of the lender/lenders. The industry- and firm-level characteristics indicate a positive correlation between a firm's size and age and its number of lending relationships, and a negative correlation between the creditworthiness of the firm and the technology and knowledge intensity of the industry and the number of lending relationships. Stein et al. (2007) set out detailed arguments from the theoretical literature supporting these correlations, arguments that are based to a large extent on the problem of information asymmetry and strategic behaviour of firms. The geographical location of the firm may also play a role, as firms from smaller communities away from financial (regional) centres may tend to borrow from the single bank that is most accessible to them. For foreign firms, ties between parent companies and foreign banks may also play a role. It is reasonable to assume, therefore, that Austrian firms, for instance, will borrow mainly from banks owned by Austrian banking groups.[38]

We analyse the determinants of the choice of bank financing model using classical regression (the pooled OLS method), fixed-effects panel regression and random-effects panel regression in order to capture the effects of variables that do not vary over time.[39] The share of the main relationship lender in the firm's total bank debt

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36 This is the unweighted average. The decline is due to a decrease in this share in individual firms and partly also to the appreciation of the Czech koruna against other currencies, as well to a change in the set of firms towards a higher proportion of (for example smaller) firms using mostly koruna loans. The relatively small average amount of this share (as compared to the often cited share of FX loans in total loans provided by domestic banks of around 20%) is due to the high proportion of smaller firms with mostly koruna loans.

37 At the end of 2008, this situation switched towards equal default vis-à-vis both relationship lenders (50% of all firms in default in 2008 Q4).

38 Variables capturing corporations' geographical ties and countries of origin were not available, so the influence of these factors was not tested in the analysis.

39 The firm size information does not vary over time as it is taken from the turnover categories in the RES (Register of Economic Agents) database and is always overwritten in the CRC historical data by the latest information.

(i.e. actually the loan concentration) was used as the dependent variable.[40] The explanatory variables used were firm characteristics, the degree of concentration of the banking market, and selected industry-level variables, namely the procyclicality of the industry (the correlation between the industry's gross added value and overall GDP) and a dummy variable for high and medium-high technology and knowledge intensity industries.[41] As the effect of firm size on bank loan concentration may be non-linear, a dummy variable was used for medium-sized and large firms.

The regression results (see Table 4) confirm that larger and older enterprises have less concentrated loans and hence a greater number of relationship lenders.[42] Some non-linearity of the effect of firm size on the share of the largest relationship lender was also confirmed, although its size is relatively small (about 2 percentage points). Firms in technology- and knowledge-intensive industries tend to concentrate their borrowing needs in one bank, whereas firms with lower creditworthiness as measured by the default rate in the past two years borrow from more than one bank (although this fixed-effects model does not find a significant effect). The results are consistent with findings for the German economy (Memmel et al., 2007; Stein et al., 2007).

The industry cyclicality effect is not provable. Stein et al. (2007) do not find a significant effect of this variable for German firms. The OLS results on the one hand and the two panel estimates on the other hand differ in our case and are significant in both cases. Economic intuition would suggest that firms in procyclical industries should use multiple relationship lenders and have less concentrated loans, as indicated by the panel estimate results, because banks do not like to be the single relationship lenders of too procyclical and hence relatively risky firms.

**Table 4 – Regression results for bank financing model
(OLS, fixed-effects model (FE) and random-effects model (RE)**

Dependent variable: Share of main relationship lender	OLS	FE	RE
Turnover	-0.0000847***		-0.0000657***
	[0.00000061]		[0.0000014]
Old firms	-0.00254***		-0.00218***
	[0.000029]		[0.000059]
Dummy for technology- and knowledge-intensive industries	0.00634***		0.0101***
	[0.00032]		[0.00062]
Cyclicality of industry	0.0289***	-0.0338***	-0.0124***
	[0.00061]	[0.0011]	[0.00087]
Risk of firm (past default rate)	-0.00840***	0.000294	-0.00330***
	[0.00069]	[0.00087]	[0.00078]
Dummy for medium-sized and large firms	-0.0192***		-0.0217***
	[0.00041]		[0.00096]
Constant	0.969***	0.982***	1.003***
	[0.00057]	[0.00081]	[0.00092]
No. of observations	717,346	717,346	717,346
No. of banks	63,088	63,088	63,088
R-squared	0.08	0.01	0.01

Standard error in parentheses, *** $p<0.01$, ** $p<0.05$, * $p<0.1$

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40 Alternatively, we also used the number of banks the firm borrows from. Given the nature of this variable, which takes discrete values between 1 and 11, in this case we used Poisson regression, which takes the categorical nature of the dependent variable into account. The results, however, are in line with the aforementioned findings.
41 See CZSO, *Klasifikace zpracovatelského průmyslu podle technologické náročnosti* [Classification of manufacturing by technology intensity] and *Klasifikace odvětví služeb podle znalostní náročnosti* [Classification of services by knowledge intensity].
42 Information on turnover is not available for all firms, so the regressions using this variable were performed only on a subsample containing roughly half the number of firms.

5. EFFECT OF APPLICATION OF SINGLE RELATIONSHIP BANKING ON BANKING PORTFOLIO RISK

Does a bank's orientation towards clients applying dominant relationship banking have an effect on its portfolio risk, and is that effect positive or negative? The above analysis of the determinants of the choice of relationship banking model showed that firms with higher creditworthiness (lower default risk) tend to concentrate their loans in a single dominant relationship lender.[43] According to von Thadden (2004) this is consequence of a dynamic process where creditworthy clients stay with their main relationship lender while uncreditworthy clients switch to the model of multiple relationship lenders. Over time, the higher proportion of firms applying dominant relationship banking with such lenders should thus give rise to a lower corporate portfolio default rate. However, large firms, which are generally less risky but due to their size are often financed by syndicated loans from several banks, may have the opposite effect.

To answer this question, we performed a panel regression in which the dependent variable was the default rate in banks' corporate loan portfolio. The explanatory variables used were portfolio characteristics, macroeconomic indicators and in particular an indicator for the bank's orientation towards "single" clients as measured by the ratio of loans to clients applying dominant relationship banking to the bank's total loan portfolio.

The panel regression results reveal that an orientation towards clients applying dominant relationship banking has a positive effect on the bank's loan portfolio quality. This result can be explained by a better knowledge of such clients by the bank and more effective risk management in this segment and is largely in line with the theoretical literature (Rajan, 1992; von Thadden, 2004). The panel regressions containing all the banks did not prove any dependence of their credit risk on the economic cycle as measured by GDP growth.[44] This is largely due to the inclusion of numerous small and medium-sized banks, whose share in the credit risk of the banking sector's total loans is relatively negligible. However, these banks, given their relatively small loan portfolios, different strategies and specialisations in selected segments of the economy, can show relatively sizeable changes in portfolio structure and performance that are not primarily correlated with the economic cycle.[45] If we perform this regression for large banks only, dependence on the economic cycle is confirmed.

An orientation towards small firms fosters a higher default rate, although this factor is reflected in higher client interest rates. Moreover, single or dominant relationship banking, where the main bank knows the company well and is better able to manage the risks, predominates in small companies. A lower default rate is fostered by greater orientation of banks towards foreign-controlled corporations and a lower proportion of FX loans. The last two factors, however, are insignificant in large banks.

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43 Although the fixed-effects panel regression results did not support this conclusion, the alternative estimates of the effect of this variable on the number of relationship lenders confirm it.

44 The other macroeconomic variables were either insignificant or had a sign inconsistent with economic intuition.

45 Some small and medium-sized banks, for example, applied an aggressive strategy to win market share, leading to growth in the credit risk of their portfolios at times when the economy was growing strongly.

**Table 5 – Panel regression results for credit risk
(fixed-effects model; all banks excluding banks with zero default rate)**

Dependent variable: 12M default rate	All banks	Large banks
Share of clients applying dominant relationship banking	-0.125***	-0.105**
	[0.038]	[0.049]
Share of small corporations in total portfolio	0.109**	0.129***
	[0.049]	[0.045]
Share of foreign-controlled corporations in portfolio	-0.0986**	0,00899
	[0.043]	[0.049]
Share of FX loans in portfolio	0.0987***	-0,0296
	[0.038]	[0.062]
GDP growth (y-o-y)	0,00181	-0.00394***
	[0.0018]	[0.00099]
Constant	0.0706**	0.0754**
	[0.028]	[0.037]
No. of observations	412	100
No. of banks	17	4
R-squared	0.06	0.25

Standard error in parentheses, *** p<0.01, ** p<0.05, * p<0.1

6. CONCLUSIONS

The results of the analysis of the model of bank financing of firms in the Czech Republic revealed a high relevance of single (sole) relationship banking. This model is applied primarily by small and young firms in technology- and knowledge-intensive industries. By contrast, less creditworthy firms and firms in cyclical industries tend to borrow from more than one bank. The data used also indicated different behaviour of firms towards individual lenders depending on their importance. This confirms the hypothesis that firms choose their bank financing model strategically with regard to their ability to obtain the cheapest possible financing and to take advantage of the specialisations of various types of banks.

The finding that the level of credit risk at bank level decreases significantly in line with the extent to which firms applying dominant relationship banking occur in a bank's portfolio is relevant to the financial stability area.

REFERENCES

ELSAS, R. (2005): *Empirical Determinants of Relationship Lending*, Journal of Financial Intermediation, Vol. 14, pp. 32–57.

ELSAS, R., KRAHNEN, J. P. (1998): *Is Relationship Lending Special? Evidence from Credit Files in Germany,* Journal of Banking and Finance, Vol. 22, pp. 1283–1316.

BOLTON, P., SCHARFSTEIN, D. (1996): *Optimal Debt Structure and the Number of Creditors*, Journal of Political Economy, Vol. 104, pp. 1–25.

GORTON, G., SCHMID, F. (1996): *Universal Banking and the Performance of German Firms,* Working Paper 5453, National Bureau of Economic Research, Cambridge, MA.

HARHOFF, D., KÖRTING, T. (1998): *Lending Relationships in Germany: Empirical Evidence from Survey Data,* Journal of Banking and Finance, Vol. 22, pp. 1317–1353.

LEHMANN, E., NEUBERGER, D. (2001): *Do Lending Relationships Matter? Evidence from Bank Survey Data in Germany,* Journal of Economic Behavior and Organization, Vol. 45, pp. 339–359.

MEMMEL, C., SCHMIEDER, C., STEIN, I. (2007): *Relationship Lending – Empirical Evidence for Germany,* Deutsche Bundesbank Discussion Paper 14/2007.

MEMMEL, C., SCHMIEDER, C., STEIN, I. (2008): *When Do Companies Choose Relationship Lender, When Do They Switch?* Deutsche Bundesbank, unpublished.

NAM, S. W. (2004): *Relationship Banking and its Role in Corporate Governance*, ADB Institute Research Paper Series No. 56.

ONGENA, S., SMITH, D. (2001): *The Duration of Bank Relationships*, Journal of Financial Economics, Vol. 61, pp. 449–475.

PETERSEN, M., RAJAN, R. (1994): *The Benefits of Lending Relationships: Evidence from Small Business Data,* Journal of Finance, Vol. 49, pp. 3–37.

RAJAN, R. (1992): *Insiders and outsiders: The choice between relationship and arms length debt.* Journal of Finance, Vol. 47, pp. 1367–1400.

SCHMIEDER, C., MEMMEL, C., STEIN, I. (2008): *Relationship Lending – Do Firms Benefit?* Deutsche Bundesbank, unpublished.

STEIN, I., MEMMEL, C., SCHMIEDER, C. (2007): *Relationship Banking and Financing Costs: Empirical Evidence for Germany,* Deutsche Bundesbank Discussion Paper, forthcoming.

VON THADDEN, E. L. (2004): *Asymmetric Information, Bank Lending and Implicit Contracts: The Winner's Curse,* Finance Research Letters, Vol. 1, pp. 11–23.

ESTIMATING EXPECTED LOSS GIVEN DEFAULT

Petr Jakubík and Jakub Seidler

This article discusses the estimation of a key credit risk parameter – loss given default (LGD) – and calculates it for selected companies traded on the Prague Stock Exchange. The importance of estimating LGD stems from the fact that a lender's expected loss is the product of the probability of default, the credit exposure at the time of default and the LGD. The Mertonian structural approach is used for LGD estimation. This technique enables us to derive LGD for publicly traded companies from a knowledge of their debt and share prices. It is reasonable to assume that the resulting LGD calculated for selected companies traded on the Prague Stock Exchange represents a lower estimate of this parameter for the entire corporate sector.

1. INTRODUCTION

The increase in global risk on world financial markets has underlined the importance of correctly estimating future credit losses. This recent experience shows how underestimation not only of the probability of default (PD), but also of the loss given default (LGD), can threaten the stability of financial markets. Over the past 20 years most effort has been put into estimating PD, but attention is now turning increasingly to estimation of the realised losses a lender will suffer if a counterparty defaults. These efforts were stepped up with the arrival of the New Basel Capital Accord (Basel II), which identifies LGD along with PD as a key risk parameter and, under the IRB[46] approach, allows banks to use internal methods to estimate it (see BCBS, 2005). Interest in LGD and in methods of calculating it has therefore been rising strongly in recent years.

As LGD is derived from many factors, such as the degree of subordination of debt, collateral and macroeconomic conditions, future LGDs are quite difficult to estimate. This article sets out to explain the LGD concept and to apply an LGD estimation method based on market data for the Czech economy.[47] The available data allow such techniques to be applied only to the corporate sector, not the household sector. Within the corporate sector, the methodology could only be applied to selected companies listed on the Prague Stock Exchange (PSE). For this segment the average LGD was constructed, which can be regarded as a lower estimate of the LGD for the corporate sector as a whole.

The next section presents the LGD concept and explains in detail the method used to estimate LGD based on market data. Section 3 is devoted to aggregate results for companies listed on the PSE. Section 4 compares the characteristics of the firms analysed with the indicators for the aggregate corporate sector and analyses the relationship between the estimated indicator and the probability of default. The concluding section summarises the results.

2. THE LGD CONCEPT

LGD is usually defined as the percentage loss rate suffered by a lender on a credit exposure if the obligor defaults. In other words, even if the counterparty defaults (fails to repay the amount owed), the lender will usually succeed in recovering some percentage of the current amount owed in the process of workout or sale of the obligor's assets. This percentage is termed the recovery rate (RR), i.e. the following relation holds: $RR = 1 - LGD$.[48] LGD can be estimated on the basis of historical data on realised losses.[49] Another modelling technique focuses on

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46 The IRB (Internal Rating Based) approach allows banks in some cases to use internal PD and LGD estimates for calculating capital adequacy (see BCBS, 2005).

47 An alternative approach is to estimate LGD based on historical losses.

48 LGD also comprises other costs related to default of the obligor. A more accurate formula for the relationship between LGD and RR is therefore LGD = 1 – RR + Costs of Default. In the text that follows, however, we will regard RR and LGD as complements, as costs are relevant to only some types of LGD and tend to be negligible by comparison with RR (see Schuermann, 2004).

49 Although banks have started gathering such information in recent years, it is not publicly available.

the information contained in market prices of risky instruments and attempts to use this information for ex-ante estimation of future LGDs. Owing to the unavailability of relevant data covering realised losses, this article concentrates on the second method, deriving LGD from market data (implied market LGD).

This approach is based on Merton's (1974) structural model, in which the theory of option pricing is used to determine corporate debt. Merton drew directly on the work of Black and Scholes (1973), who were the first to mention the possibility of valuing a firm's liabilities and equity as an option on the firm's assets. In the Mertonian approach, the firm's balance sheet consists of the market values of the individual items. The left-hand side represents the market value of assets V. On the liability side are the market value of equity E and the market value of debt D.[50] In this concept, the market value of the firm's assets V equals the sum of the market price of equity E and the market price of debt D with face value F maturing at time T.[51] In Merton's original approach, the firm defaults if, on the debt maturity date, the value of the firm is less than the face value of the debt.[52] In such case, it does not pay the equity holders to repay the debt. They do not exercise the option and hence they turn the firm over to the debtholders. The value of equity is therefore identical to the value of a European call option on the firm's value with an exercise price corresponding to the face value of the debt F (see Merton, 1974).[53]

The probability of default can be expressed as the probability that the value of the firm on the debt maturity date will be less than the amount the equity holders have to repay, i.e.

$$PD = \Pr(V_T \leq F) \tag{1}$$

where V_T denotes the value of the firm on the maturity date. This situation is described by the following chart, which shows the evolution of the value of a firm that defaults on the maturity date ($V_T < F$). If this event occurs, the debtholders are only paid the value of the firm at the maturity date (V_T) instead of the original amount of their claim F. The ratio of the expected value of the firm at the maturity date to the face value of the debt can thus be regarded as the recovery rate (RR).[54]

Chart 1 – Possible evolution of value of firm over time

Value of firm V   Face value of debt F

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50 This approach can introduce ambiguities from the perspective of the traditional accounting approach. For example, the term "equity" in the Mertonian approach refers not to the book value of equity, but to the market value of equity, i.e. market capitalisation (see Merton, 1974, Jones et al., 1984, Hillegeist et al., 2004, etc.).

51 Another simplifying assumption is that there are no taxes. For this reason, the tax shield is not considered and the market value of the firm's assets V can be regarded as identical to the firm's total value.

52 In reality default can occur at any time before the maturity of the debt. According the Czech legislation in force, bankruptcy happens if a firm is (i) unable to pay, i.e. its monetary debts are more than 30 days past due and it is no longer able to repay them, (ii) overindebted, i.e. the sum of all the obligor's liabilities exceeds the sum of its assets. Moreover, the actual definition of default in the Mertonian approach corresponds more closely to bankruptcy than to the traditional Basel II definition of default (i.e. payment more than 90 days past due).

53 The value of the debt can be viewed as the value of a European put option with an exercise price of F. Unlike American options, European options cannot be exercised before the maturity date T.

54 More accurately this is the conditional mean of the value of the firm at the maturity date T, given the default event, i.e. $E(V_T | V_T < F)$.

If we make some assumptions about the evolution of the value of the firm V over time,[55] we can obtain a closed-form formula for the expected value of the firm at the maturity date and hence for RR as well. If we further modify the original Mertonian model for dividend payouts, we obtain the final expression for estimation of the expected LGD (ELGD) as a function of the face value of the debt F, the value of the firm V, the maturity date T, the costs of default $(1-\varphi)$,[56] the dividend rate δ, the expected growth in the firm's assets μ_V and the volatility of those assets σ_V, i.e.

$$LGD = 1 - \varphi \cdot RR(F, V, T, \delta, \mu_V, \sigma_V)$$

(2)

A detailed description of the model and its derivation can be found in Seidler and Jakubík (2009). ELGD increases *(ceteris paribus)* with growing face value of the debt F and with rising volatility of the firm's value σ_V, which increases the probability that the firm's value on the maturity date will be less than the value of the debt. Longer debt maturity also causes greater uncertainty about the firm's future value. ELGD is therefore rising in T. Growth in the dividend rate δ also increases ELGD, because dividend payouts reduce the firm's value and thus make it more prone to default from the credit risk perspective. Conversely, ELGD falls with rising market value of the firm V and rising expected growth in its assets μ_V.

The empirical use of structural models, and thus also the calculation of ELGD from equation (2), is limited by the fact that variables such as the firm's value V and its volatility are not directly observable and must be estimated. The technique for obtaining these estimates was first proposed by Jones et al. (1984) and uses knowledge of the market value of equity E and its volatility σ_E, which are easy to determine. We thus obtain the estimated variables V and σ_V by simultaneously solving two equations based on the Mertonian approach which match the known values of E and σ_E with the estimated values of V and σ_V. Due to the non-linearity of those equations it is necessary to solve the system numerically (see Hillegeist et al., 2004).

We obtain the market value of equity E as the share price at the end of the fiscal year multiplied by outstanding number of stocks. Four methods were chosen for calculating volatility σ_E. The average of the two highest values then enters the system of equations for the calculation of V and σ_V.[57] For the sake of simplicity, we used the book value of liabilities at the end of the relevant year as the face value of the debt. The maturity of the debt was set arbitrarily at five years for all firms as the average maturity of short-term and long-term debt.[58] To extract δ we used the ratio of the absolute amount of dividend payouts in the given year to the value of the firm. The costs of default were set at 10% on the basis of the study by Andrade and Kaplan (1998).

Historical values of δ, volatility σ_E, the current market value of equity E and the book value of liabilities F can be obtained for each year. Using these values we can numerically calculate the firm's current market value V and its volatility σ_V. By substituting these variables into equation (2) we then obtain the ELGD at the five-year horizon.

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55 We assume that the value of the firm follows a geometric Brownian motion over time (see Hull, 2002).

56 Owing to the costs of default, the final recovery rate achieved by the debtholders will be lower, i.e. $\varphi \cdot V_T$ expresses the residual value of the firm's assets at time T net of the costs of default. We can thus express ELGD as $ELGD = 1 - \varphi \cdot RR$.

57 This approach is chosen to capture the different values of σ_E over time and to better differentiate the current volatility from its historical values. For this reason we calculated (i) the basic volatility over 250 trading days, (ii) the five-year volatility using the exponentially weighted moving average, where more recent observations carry higher weights, (iii) the long-term volatility using GARCH(1,1) and (iv) the long-term five-year volatility.

58 For most firms the average debt maturity is shorter in reality. A longer time period was chosen for conservative reasons in order to ensure that the LGD estimates obtained were slightly overestimated rather than slightly underestimated.

3. RESULTS

The aforementioned approach was applied to non-financial corporations listed on the Prague Stock Exchange in 2000–2008. The least liquid companies were excluded from the sample. We also excluded firms that entered the PSE after 2007 on the grounds of an insufficiently long time series. Accounting data for the companies analysed were obtained from the Magnus (2008) database, and for some firms these were supplemented with information from the relevant annual reports. Share prices, share numbers and dividend payouts were obtained from the PSE website and internal CNB data.

The aggregate results for the 15 selected companies are given in the following table.[59]

Table 1 – ELGDs

LGD (%)	2000	2001	2002	2003	2004	2005	2006	2007	2008*
Maximum	78.4	76.6	58.5	57.9	45.0	28.9	29.5	41.2	73.6
Minimum	24.0	15.8	21.7	16.5	15.6	13.0	13.2	13.2	14.5
75th percentile	67.5	53.2	43.3	34.0	31.3	20.0	22.3	25.8	53.7
25th percentile	32.7	28.4	28.5	19.7	20.6	15.9	15.8	16.4	22.7
Median	42.9	48.3	36.2	26.2	21.6	18.5	18.7	19.2	33.9
Mean	**48.8**	**44.8**	**37.0**	**29.6**	**25.4**	**18.8**	**19.5**	**22.2**	**39.9**
Std. Dev.	**19.4**	**19.1**	**12.1**	**13.2**	**9.2**	**4.4**	**5.0**	**9.3**	**19.6**

Source: Authors' calculations
* The estimates for 2008 draw on equity market information which, however, is based on 2007 accounting data

The highest ELGD, exceeding 78%, occurred in 2000 in a company that posted a large loss. This negative result led to a sharp decline in the firm's share price and an almost 24% drop in the value of its assets. Some companies recorded a rise in ELGD despite posting profits. This was usually due to negative stock market developments and growth in the volatility of the firm's assets. Some firms recorded a sharp fall in value together with a high dividend payout and thus also a sizeable increase in ELGD.

The calculations for 2008 are still based on the previous year's accounting data and are therefore more an illustrative example of how stock market developments influenced the LGD estimates in 2008. Some companies showed moderate LGD growth differing little from the previous years' values, whereas others recorded sharp growth several times higher than the historical values of this indicator. The latter were mostly companies that had been listed on the PSE for a short time only. However, where the value of their liabilities fell significantly compared to 2007, the given ELGD estimates may be considerably overestimated.

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59 The 15 companies under analysis account for around 7% of the corporate sector's total assets.

Chart 2 – Evolution of average ELGD (%)
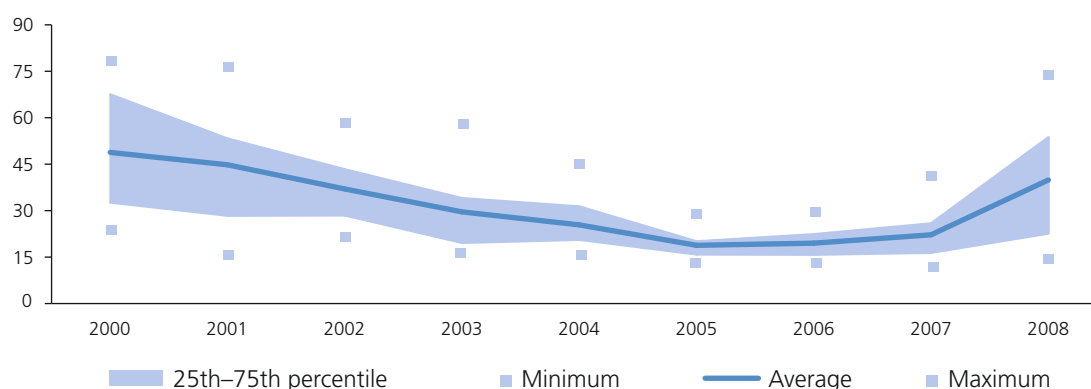
Source: Authors' calculations

Chart 2 displays the evolution of the average LGD and its volatility over time. It is apparent that the average LGD of the sample of firms analysed was falling until 2006, as was its volatility as illustrated by the 25th–75th percentiles. Although the average LGD rose slightly in 2007, the growth was fairly insignificant, so it seems that the stock market in 2007 still did not contain information on the subsequent financial turbulence. Given the stock market falls in 2008, we can expect sharp growth in the average LGD in that year. This is confirmed by twofold growth in the preliminary values of this indicator.

4. APPLICATION OF THE RESULTS

The above estimated LGDs for the set of firms under review can be used only as a rough estimate of the LGD for the corporate sector as a whole. It is reasonable to assume that firms traded on the PSE are less risky, hence their LGD is the lower estimate of the average LGD for the corporate sector overall. For the LGD calculation method used, this assumption corresponds to lower leverage and greater potential for growth in the firm's value. If we use return on assets (RoA) as a proxy for growth in the firm's value, a comparison of the time series suggests higher growth for the companies under analysis than for the corporate sector as a whole (see Chart 3).[60] The evolution of RoA also reveals that the profitability of the firms under analysis rises more relative to the corporate sector average at a time of economic growth. Conversely, during an economic slowdown the differences are less significant. Likewise, firms that use the stock market to raise funds are less leveraged relative to the corporate sector average (see Chart 4).[61]

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60 The profit time series correlation between the aggregate corporate sector and the firms under analysis is 90%.
61 Leverage was defined as the ratio of total payables and total liabilities and return on assets as the ratio between the sum of depreciation, costs and pre-tax profits and total assets.

Chart 3 – RoA for companies under analysis vs. aggregate corporate sector (%)
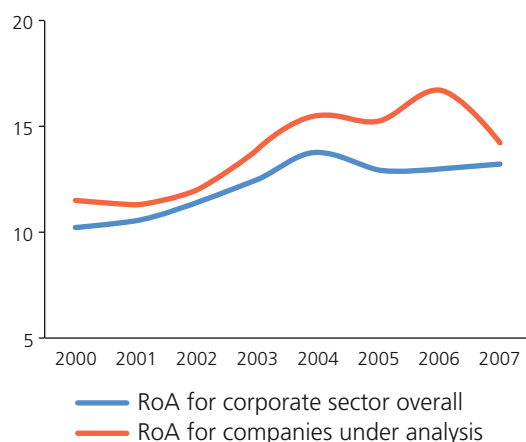
Source: CZSO, Magnus

Chart 4 – Leverage for companies under analysis vs. aggregate corporate sector (%)
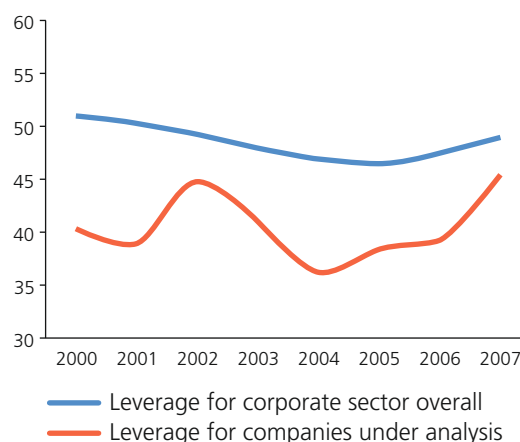
Source: CZSO, Magnus

The LGD estimate we obtain gives us some idea about the true value of this indicator for the corporate sector and, together with the aggregate default rate, enables us to better estimate banks' future potential losses on corporate loans.[62] These estimates can also be used to refine the banking sector stress tests used for financial stability analysis. The World Bank gives a recovery rate of claims on insolvent firms of 21% for the Czech Republic, which equates to an LGD of 79%.[63] Owing to a different calculation methodology, however, this figure cannot be compared directly with our implied market estimate. Correct LGD assessment in our case requires all future information to be contained in market data. The indicator thus does not reflect future growth in risk due to developments not expected by market participants. In this regard, our concept is relatively procyclical.[64] It is clear from the following chart that the LGD estimate is quite strongly correlated with the corporate sector default rate (see Chart 5).[65] The expected losses of debtholders correspond to the product of these two parameters, and the credit exposures will differ from the actual losses by the square of the prediction errors of these two parameters. This can lead to significant underestimation of the total loan loss. Our conclusions are in line with the empirical evidence of the correlation between PD and LGD in the literature (e.g. Altman et al., 2005).

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62 Banks' average losses can be estimated as the product of credit exposure, the average probability (rate) of default and the average LGD.

63 This figure is based on data for 6/2006–6/2008. According to these data, the recovery rate for insolvent Czech firms is one of the lowest in Europe. The figures for other countries are: Poland 30%, Slovakia 46%, Germany 52%, Italy 57%, Portugal 69%, the UK 84% and Belgium 86% (The World Bank, 2008).

64 However, share prices can also be influenced by events that are not directly linked with changes in expectations regarding future risks – for example a fight for a majority. Such jumps in prices, however, will be corrected in time and the short-term change in volatility will not be significant enough in the five-year volatilities used to further affect the future LGD estimates.

65 The 12M default rate of non-financial corporations expresses the actual default rate in the 12 months following the period under review. The 2007 figure expresses the default rate during 2008. The 2008 figure is thus only an estimate. LGD refers to the expected percentage loss given default at the five-year horizon.

Chart 5 – Evolution of average ELGD and corporate sector default rate (%)

ELGD (left-hand scale)

Actual 12M default rate of non-financial corporations (right-hand scale)
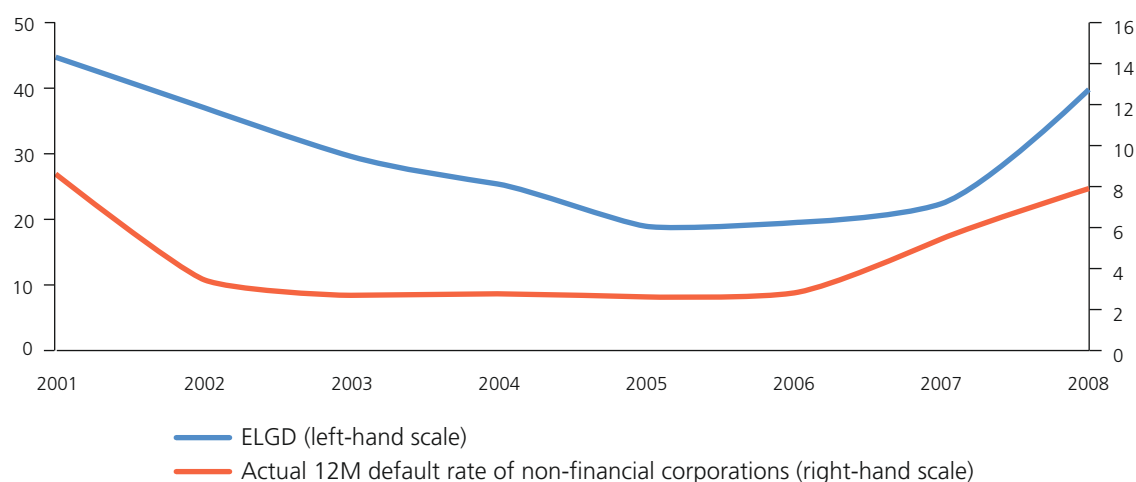
Source: CCR and authors' calculations

5. CONCLUSIONS

In this article we presented a method for estimating loss given default for firms traded on the Prague Stock Exchange. LGD is dependent on numerous factors and so the methods used to estimate it are not straightforward and still rank among the open problems of contemporary credit risk management. This study describes the LGD concept and uses a modified Mertonian structural model to estimate the five-year LGD for selected companies listed on the PSE in the 2000–2008 period. The chosen method does not use historical LGDs, but attempts to extract LGDs from market data. For this reason, the methodology is applicable to publicly traded companies only. The use of market information allows us to incorporate current impulses from the financial markets into the LGD estimates. On the other hand, one should bear in mind that these estimates may be distorted by over-optimistic expectations about future economic conditions.

The calculations reveal that the average LGD of the sample of firms analysed varies over time from 20 to 50%. The approach described above is based on a number of simplifying assumptions. There are no taxes, the firm's overall debt structure is represented by a single zero-coupon bond, and default can occur only on maturity of the debt. The calculations also abstract from the various degrees of debt subordination in the capital structure of firms. Despite all these assumptions, though, our constructed indicator of the average LGD of the publicly traded non-financial corporations under analysis probably equates to a lower estimate of the corporate sector LGD.

REFERENCES

ALTMAN, E. I., BRADY, B., RESTI, A., SIRONI, A. (2005): *The Link between Default and Recovery Rates: Theory, Empirical Evidence, and Implications*, Journal of Business, Vol. 78, No. 6, pp. 2203–2228.

ANDRADE, G., KAPLAN, S. (1998): *How Costly is Financial (Not Economic) Distress? Evidence from Highly Leveraged Transactions that Became Distressed*, The Journal of Finance, Vol. 53, No. 5, pp. 1443–1493.

BLACK, F., SCHOLES, M. (1973): *The Pricing of Options and Corporate Liabilities*, Journal of Political Economy, Vol. 81, No. 3, pp. 637–654.

BCBS (2005): *International Convergence of Capital Measurement and Capital Standards: A Revised Framework,* Basel: Basel Committee on Banking Supervision – Bank for International Settlements, November 2005, ISBN 92 9197 669 5.

HILLEGEIST, S., KEATING, E., CRAM, D., LUNDSTEDT, K. (2004): *Assessing the Probability of Bankruptcy,* Review of Accounting Studies, Vol. 9, pp. 5–34.

HULL, J. (2002): *Options, Futures, and Other Derivatives,* Prentice Hall, 2002, p. 744, 5th ed., ISBN 13 978–0130090560.

JONES, E., MASON, S., ROSENFELD, E. (1984): *Contingent Claims Analysis of Corporate Capital Structures: An Empirical Investigation,* Journal of Finance, Vol. 39, No. 3, pp. 611–625.

MAGNUS (2008): *The Database of the Czech Capital Information Agency,* ČEKIA, 2008.

MERTON, R. (1974): *On the Pricing of Corporate Debt: The Risk Structure of Interest Rates*, Journal of Finance, Vol. 29, No. 2, pp. 449–470.

SEIDLER, J., JAKUBÍK, P. (2009): *Implied Market Loss Given Default in the Czech Republic: Structural-Model Approach,* Czech Journal of Economics and Finance, Vol. 59, No. 1, pp. 20–40.

SCHUERMANN, T. (2004): *What Do We Know About Loss Given Default?* New York: Federal Reserve Bank.

THE WORLD BANK (2008): *Doing Business 2009.*

GLOSSARY

Balance-sheet liquidity

The ability of an institution to meet its obligations in a corresponding volume and term structure.

Capital adequacy ratio

The ratio of regulatory capital to total risk-weighted assets. Tier 1 capital adequacy is the ratio of Tier 1 capital to total risk-weighted assets (see also Tier 1).

Credit default swap (CDS)

A credit derivative in which the buyer of the collateral undertakes to pay the seller periodical fixed payments ("swap premium") for the duration of the contract in exchange for a conditional payment of the counterparty in the case of default of the "reference entity" to which the agreement refers. If default does not occur, the contract terminates at a specified time and the seller only gains a premium for taking on the potential credit risk.

Credit premium

The premium on the return on a portfolio for credit risk.

Custody

Banks offer their clients the service of safekeeping and management of securities and settlement of securities transactions on both domestic and foreign markets. The bank opens and maintains a securities owner account for the customer, on which it performs settlement of the customer's capital market trades as instructed by the customer. As the custodian, the bank performs activities directed at preserving the rights attaching to the securities in its custody.

Debt deflation

A situation where the real value of the debt of corporations and households rises as a result of falling prices and incomes. This happens primarily in a situation where the decrease in nominal interest rates is insufficient to offset the fall in the rate of growth of incomes.

Default

Default is defined as a breach of the debtor's payment discipline. The debtor is in default at the moment when it is probable that he will not be able to repay his obligations in a proper and timely manner, without recourse by the creditor to settlement of the claim from the security, or when at least one repayment (the amount of which deemed by the creditor to be significant) is more than 90 days past due.

Default rate

The 12-month default rate is the number of new defaulters over a 12-month reference period as a proportion of the total number of entities existing in that period. The default rate can also be defined analogously in terms of volume based on the obligations assumed by debtors.

Eligible collateral

An asset accepted to ensure fulfilment of an obligation to the central bank.

Equalisation provision

The equalisation provision is set aside for individual areas of non-life insurance and is intended to equalise increased insurance claim costs arising due to fluctuations in loss ratios as a result of facts independent of the will of the insurance company.

Herfindahl index (HI)

The sum of the squares of the market shares of all entities operating on a given market. It expresses the level of concentration in the market. It takes values between 0 and 10,000. The lower the HI, the less concentrated the market.

Household insolvency A situation where a household is unable to cover its current expenditures by its current income and the sale of its asset holdings. Insolvency is defined in legal terms in Act No. 182/2006 Coll., on Insolvency and Methods of Resolution Thereof.

Institutional investor Either (a) a bank executing trades in investment instruments on its own account on the capital market, an investment company, an investment fund, a pension fund or an insurance company, or (b) a foreign entity authorised to carry on business in the same fields in the Czech Republic as the entities listed under (a).

Interest rate spread Also interest rate differential; the spread between the interest rate on a contract (deposit, security) and a reference interest rate.

Interest rate transmission channel

One of the channels of the monetary policy transmission mechanism. It acts such that, for example, an increase/decrease in monetary policy interest rates leads first to an increase/decrease in interest rates on the interbank market. Consequently, there is an increase/decrease in the interest rates announced by banks for the provision of loans and the acceptance of deposits. The result is a downturn/upturn in investment activity as a part of aggregate demand and ultimately a decrease/increase in inflation pressures.

Liquidity Money in the broader sense (cash, short-term assets quickly exchangeable for cash, etc.).

Loss given default (LGD) The ratio of the loss on an exposure in the event of counterparty default to the amount owed at the time of default (see also Default).

Loan-to-value (LTV) ratio The ratio of a loan to the value of pledged property.

Market liquidity The ability of market participants to carry out financial transactions in assets of a given volume without causing a pronounced change in their prices.

Monte Carlo simulation A numerical technique based on repeated random sampling. It employs a large number of simulations of a particular random variable to determine its approximate distribution and thus also the most likely value it can take.

Natural population increase

The difference between the number of live births and the number of deaths in the same period of time in a given area. See also Total population increase.

Non-performing loans Loans in default, i.e. loans in the substandard, doubtful and loss categories.

Overnight segment The money market on which overnight funds are traded.

Price-to-income The ratio of the price of a flat (68 m^2) to the sum of the annual wage in a given region over the last four quarters.

Price-to-rent The ratio of the price of a flat to the annual rent. The price-to-rent ratio is the inverse of the rent return.

Property developers/developments

Companies/projects whose aim is to build a complex of residential and commercial property. Property developers' work includes choosing an appropriate site, setting up a project, obtaining the necessary permits, building the necessary infrastructure, constructing the buildings and selling the property. Developers also often organise purchase financing for clients and frequently lease or manage the property once it is built (especially in the case of commercial property). Given the combination of construction activity and speculative property purchases, developers' results are strongly dependent on movements in property prices.

Property supply prices

Property sale supply prices in estate agencies. Supply prices should be higher than transfer prices. Property supply prices in the Czech Republic are published, for example, by the CZSO and the Institute for Regional Information (which also publishes data on market rent supply prices). See also Property transfer prices.

Property transfer prices (aka "Property realisation prices")

Prices based on Ministry of Finance statistics from property transfer tax returns and published by the CZSO. These prices are the closest to actual market prices in terms of methodology, but are published with a time delay. See also Property supply prices.

Quantitative easing

A method for implementing monetary policy in a situation where the central bank is no longer able to lower its monetary policy rate because it has already reduced it almost to zero. Quantitative easing involves the central bank buying assets from commercial banks and thereby creating a sizeable stock of free reserves with those banks. The purpose of this type of policy is to strengthen the balance-sheet and market liquidity of the banking system and minimise the risk of growth in interest rates due to insufficient liquidity. Japan has applied quantitative easing in the past decade, and the US Fed, for example, is to some extent pursuing a similar policy at present.

Rent return

The ratio of the annual supply rent to the supply price of the flat. It is the inverse of the price-to-rent indicator.

Risk premium

The risk premium an investor demands on investments in riskier financial instruments.

Secondary market

The market on which existing securities are traded.

Solvency

Solvency in the insurance sector is the ability of an insurer to meet its insurance obligations, i.e. to settle eligible insurance claims arising from insured losses. Solvency II – a new regulatory framework prepared by the European Commission – is a set of rules for European insurance companies and reinsurers laying down quantitative requirements, qualitative requirements, prudential rules, compliance with market discipline and disclosure duties.

Technical provisions

Under the Act on Insurance, an insurer must set aside technical provisions to meet insurance obligations which are either likely to be incurred or certain to be incurred but uncertain as to amount or as to the date on which they will arise.

Tier 1   The highest quality and, for banks in the Czech Republic, also the most significant part of regulatory capital. The dominant components of Tier 1 are equity capital, retained earnings and mandatory reserve funds.

Value at risk   The size of loss, with predefined probability, which a bank may suffer when holding a current portfolio for a certain period if market factors (e.g. interest rates, exchange rates) develop unfavourably.

Yield spread   Also yield differential; the spread between the yield on a bond and the yield on a reference ("benchmark") bond.

AFAM CR	Association of Funds and Asset Management of the Czech Republic
AKAT	Czech Capital Market Association
APF CR	Association of Pension Funds of the Czech Republic
ATM	automated teller machine
b.p.	basis point
BIS	Bank for International Settlements
CAP	Czech Insurance Association
CAR	capital adequacy ratio
CCR	Central Credit Register
CDS	credit default swap
CEBS	Committee of European Banking Supervisors
CEE	Central and Eastern Europe
CEIOPS	Committee of European Insurance and Occupational Pensions Supervisors
CERTIS	Czech Express Real Time Interbank Gross Settlement System
CESR	Committee of European Securities Regulators
CLFA	Czech Leasing and Finance Association
CNB	Czech National Bank
CZ	Czech Republic
CZEONIA	Czech OverNight Index Average (reference O/N interest rate on the interbank market)
CZK	Czech koruna
CZSO	Czech Statistical Office
EA	euro area
EC	European Commission
ECB	European Central Bank
EEA	European Economic Area
EIB	European Investment Bank
EMBI	Emerging Market Bond Index
EMU	European Monetary Union
EONIA	Euro OverNight Index Average (reference O/N interest rate on the interbank market)
ESCB	European System of Central Banks
EU	European Union
EU-12	euro area as of 2001–2006
EUR	euro
EURIBOR	Euro InterBank Offered Rate (reference interest rate on the interbank market)
FDI	foreign direct investment
FED	Federal Reserve System
FRA	forward rate agreement
GBP	pound sterling
GDP	gross domestic product
HI	Herfindahl index
HUF	Hungarian forint
IBRD	International Bank for Reconstruction and Development
IF	investment firm
IMF	International Monetary Fund
IPB	Investiční a Poštovní banka, a. s.
IRB	Internal Rating Based Approach, an approach within the Basel II framework for capital adequacy of banks
IRI	Institute for Regional Information
IRS	interest rate swap
JPY	Japanese yen
LGD	loss given default
LIBOR	London InterBank Offered Rate (reference interest rate on the interbank market)

LTV	loan-to-value
MCR	minimum capital requirement – the minimum required capital for calculation of the solvency of insurance companies and reinsurers
MF CR	Ministry of Finance of the Czech Republic
MiFID	Markets in Financial Instruments Directive
MLSA	Ministry of Labour and Social Affairs
MNB	Magyar Nemzeti Bank (the Hungarian central bank)
MRD	Ministry for Regional Development
NACE-CZ	Czech General Industrial Classification of Economic Activities
O/N	overnight
OECD	Organisation for Economic Cooperation and Development
OIS	overnight indexed swap
OMF	open-ended mutual fund
OR	operational risk
p.p.	percentage point
PD	probability of default
PLN	Polish zloty
PRIBOR	Prague InterBank Offered Rate (reference interest rate on the interbank market)
PSE	Prague Stock Exchange
PX	Czech stock market index
QIS	quantitative impact study
RMBS	residential mortgage-backed securities
RoA	return on assets
RoE	return on equity
RoS	return on sales
SCR	solvency capital requirement – the minimum solvency requirement for risks undertaken by insurance companies and reinsurers
SEK	Swedish krona
SKD	Short-Term Bond System
SKK	Slovak koruna
SMEs	small and medium-sized enterprises
USD	US dollar
VA	value added
VAT	value added tax

Country abbreviations:

AT	Austria		KO	Korea
AU	Australia		LT	Lithuania
BE	Belgium		LU	Luxembourg
BG	Bulgaria		LV	Latvia
CH	Switzerland		ME	Mexico
CA	Canada		MT	Malta
CY	Cyprus		NL	Netherlands
CZ	Czech Republic		NO	Norway
CR	Croatia		NZ	New Zealand
DE	Germany		PL	Poland
DK	Denmark		PT	Portugal
EE	Estonia		RO	Romania
ES	Spain		SE	Sweden
FI	Finland		SI	Slovenia
FR	France		SK	Slovakia
GR	Greece		UK	United Kingdom
HU	Hungary		USA	United States
IE	Ireland			
IT	Italy			
JP	Japan			

Abbreviations of Czech regions (regional capitals in parentheses):

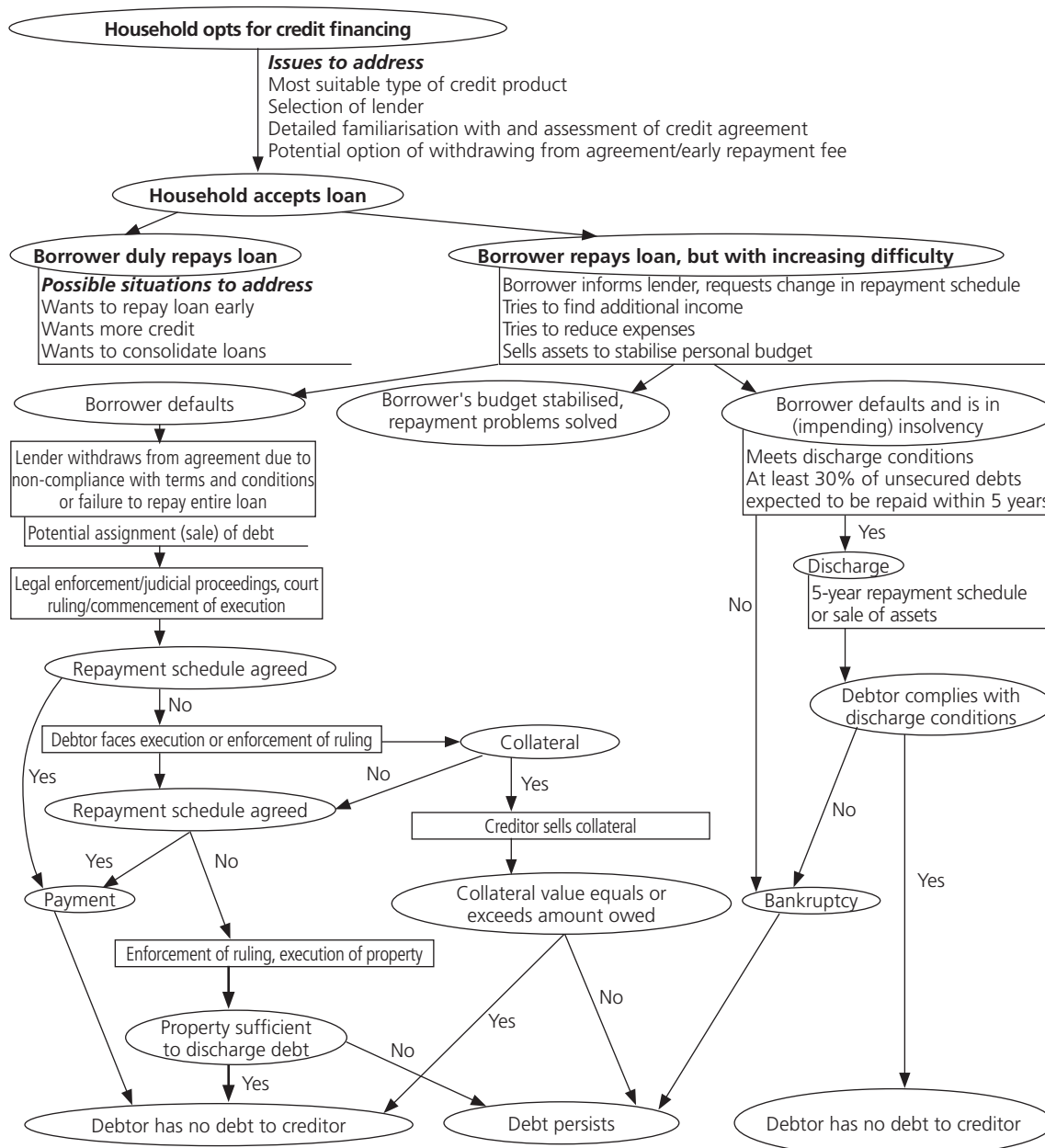|	
A	Prague
B	South Moravian Region (Brno)
C	South Bohemian Region (České Budějovice)
E	Pardubice Region (Pardubice)
H	Hradec Králové Region (Hradec Králové)
J	Vysočina Region (Jihlava)
K	Karlovy Vary Region (Karlovy Vary)
L	Liberec Region (Liberec)
M	Olomouc Region (Olomouc)
P	Plzeň Region (Plzeň)
S	Central Bohemian Region (Prague)
T	Moravian-Silesian Region (Ostrava)
U	Ústí nad Labem Region (Ústí nad Labem)
Z	Zlín Region (Zlín)

Financial stability indicators								
	2005	2006	2007	2008	2009			
					January	February	March	April
Financial soundness of banks								
Capital adequacy (%)	11.9	11.4	11.5	12.3	12.2	12.4	12.9	
Tier 1 capital adequacy (%)	11.3	10.0	10.3	11.8	11.6	11.9	12.3	
Non-performing loans / total gross client loans (%)	4.1	3.8	2.8	3.3	3.5	3.6	3.9	
Sectoral breakdown of total loans (%)								
- non-financial corporations	44.6	44.9	41.7	40.9	40.6	40.3	40.1	
- households	32.2	35.0	37.5	38.9	38.9	39.2	39.8	
- sole traders	2.8	2.5	2.2	2.1	2.0	2.0	2.1	
- other (incl. non-residents)	20.4	17.5	18.7	18.1	18.4	18.5	18.0	
Return on assets (%)	1.4	1.2	1.3	1.2	1.3	1.2	1.2	
Return on Tier 1 (%)	25.2	22.5	24.5	21.8	24.5	22.8	21.3	
Quick assets / total assets (%)	32.8	30.4	24.0	23.1	24.4	24.5	25.5	
Quick assets / client deposits (%)	50.5	45.5	36.6	35.9	37.6	37.5	38.9	
Net open position in foreign exchange / capital (%)	0.5	0.2	0.3	0.1			1.1	
Macroeconomic environment								
Real GDP growth (year on year, %)	6.3	6.8	6.0	3.2				
Consumer price inflation (end of period, %)	2.2	1.7	5.4	3.6	2.2	2.0	2.3	1.8
Public finance deficit / GDP (%)	-3.6	-2.6	-0.6	-1.5				
Public debt / GDP (%)	29.8	29.6	28.9	29.8				
Trade balance / GDP (%)	2.0	2.0	3.3	2.8				
Balance of payments current account / GDP (%)	-1.3	-2.6	-3.2	-3.1				
Monetary policy 2W repo rate (end of period, %)	2.0	2.5	3.5	2.25	2.25	1.75	1.75	1.75
Financial markets								
1Y PRIBOR (average, %)	2.1	2.7	3.4	4.1	3.3	2.6	2.7	2.7
10Y government bond yield (average, %)	3.6	3.8	4.3	4.6	4.0	4.6	5.2	5.6
Eurobond spread (EMBI spread, b.p.)	17.0	23.0	26.0	66.7				
CZK/EUR exchange rate (average)	29.8	28.3	27.8	25.0	27.2	28.5	27.2	26.8
Change in the PX stock index (% year on year, end of period)	42.7	7.7	14.2	-52.7	-48.4	-59.1	-51.7	-45.3
Real estate market								
Total change in residential property prices (transfer prices, % year on year)	6.0	10.4	18.9	12.5*				
Change in apartment prices (supply prices according to CZSO, % year on year)	0.2	13.4	23.2	19.6			9.9	
Apartment price / average annual wage	4.1	4.2	5.0	5.1				
Apartment price / rent (according to IRI)	13.6	15.3	20.3	19.9			19.9	
Non-financial corporations								
Return on equity (%)	9.5	10.5	10.9	10.4				
Debt (% of total liabilities)	46.5	47.5	48.8	49.4				
Debt (% of GDP)	40.9	39.3	45.0	46.5				
- loans from Czech banks (% of GDP)	14.8	19.7	21.1	23.0				
- loans from Czech non-bank financial corporations (% of GDP)	4.7	4.7	4.9	5.2				
- other (incl. financing from abroad, % of GDP)	22.1	15.0	16.1	18.3				
Interest coverage ratio (earnings / interest expense, %)	9.5	11.8	9.8	9.3				
12M default rate (average, %)	2.7	2.7	3.8	6.6			7.0	
Households (incl. sole traders, excl. 12M default)								
Debt / gross disposable income (%)	34.0	40.3	45.2	49.2				
Debt / financial assets (%)	22.5	26.0	28.7	31.3				
Net financial assets (total financial assets – total liabilities, % of GDP)	…	41.5	39.2	38.3				

Financial stability indicators	2005	2006	2007	2008	2009			
					January	February	March	April
Debt / GDP (%)	17.3	20.3	25.0	27.7				
- loans from Czech banks to households (% of GDP)	10.7	15.3	18.9	21.6				
- loans from Czech non-bank financial corporations to households (% of GDP)	3.1	3.1	3.7	3.6				
- loans from Czech banks to sole traders (% of GDP)	0.9	1.1	1.1	1.1				
- loans from Czech non-bank financial corporations to sole traders (% of GDP)	0.4	0.4	0.6	0.4				
- other (incl. financing from abroad, % of GDP)	2.2	0.3	0.7	1.0				
Interest expenses / gross disposable income (%)	1.1	1.3	1.9	1.7				
12M default rate of households (average, %)	…	…	3.0	3.7			4.4	
Financial sector								
Debt / gross disposable income (%)	34.0	40.3	45.2	49.2				
Debt / financial assets (%)	22.5	26.0	28.7	31.3				
Banking sector								
Share in financial sector assets (%)	74.1	73.3	74.2	75.0				
Client loans / bank assets (%)	39.5	45.2	48.4	51.8	50.5	51.0	51.0	
Client loans / client deposits (%)	62.8	69.3	75.1	80.7	77.8	78.1	77.9	
Growth in loans (%, end of period, year on year):								
total	16.7	19.9	26.4	16.4	16.2	15.6	13.5	
non-financial corporations	14.3	20.8	17.2	14.1	13.7	12.4	9.5	
- loans for property purchase (CZ-NACE 70)	36.5	37.0	37.4	21.2				
households	34.0	30.4	35.1	20.9	19.9	19.2	18.8	
- loans for house purchase	34.1	32.5	37.6	20.1	19.2	18.6	18.2	
- consumer credit	36.8	26.5	26.1	22.8	21.4	20.5	20.3	
sole traders	16.9	7.7	8.7	10.4	9.3	8.4	6.6	
Non-performing loans / total loans (%):								
non-financial corporations	5.1	4.4	3.1	4.3	4.4	4.7	5.1	
households	3.2	2.9	2.7	2.7	2.8	2.9	3.0	
- loans for house purchase	1.6	1.6	1.5	1.6	1.7	1.7	1.8	
- consumer credit	7.8	7.3	6.6	6.7	7.0	7.2	7.2	
sole traders	10.7	9.2	7.2	8.2	8.6	8.6	8.9	
Non-bank financial corporations								
Share in financial sector assets (%)	25.9	26.7	25.8	25.0				
Premiums written / GDP (%)	3.9	3.8	3.7	3.8				
Solvency of insurance companies: life insurance (%)	325	301	276	…				
Solvency of insurance companies: non-life insurance (%)	339	327	337.0	…				
Change in financial investment of insurance companies (%)	11.6	8.9	8.0	5.1				
Return on equity of insurance companies (%)	13.5	24.6	21.7	14.0				
Claim settlement costs / net technical provisions (life, %)	12.1	10.3	12.8	14.8				
Claim settlement costs / net technical provisions (non-life, %)	69.4	71.7	61.4	60.7				
Change in assets managed by pension funds (%)	20.9	18.2	14.6	14.7				
Return on equity of pension funds (%)	…	121.8	112.2	21.9				
Growth in loans from non-bank financial corporations engaged in lending (%):								
total	…	7.4	21.0	6.1				
households	…	9.2	29.8	1.5				
non-financial corporations	…	5.8	14.7	11.2				
Composite indicators**								
Banking stability index (average for period)	0.6	0.5	0.3	0.2			0.2	
Creditworthiness index for non-financial corporations (average for period)	0.971	0.973	0.972	0.972				
Market liquidity index (average for period)	0.2	0.3	0.1	-0.4	-1.2	-1.2	-1.3	-1.3

*   estimate for 2008 H1; only for family houses and apartments (around 74.4% of index)
**   see FSR 2007 and the main text of this report for the methodology and interpretation of the composite indicators

This annex covers the situations people may encounter after accepting a loan, the potential impacts of repayment problems, and the solutions available. The flow chart below depicts all the main debt-related situations of a household. Agreement with creditors is the optimal solution to problems with repayment. If this does not happen, situations less favourable to the debtor arise, namely execution proceedings or insolvency, which in the better case may result in personal bankruptcy.

Household opts for credit financing

Issues to address
Most suitable type of credit product
Selection of lender
Detailed familiarisation with and assessment of credit agreement
Potential option of withdrawing from agreement/early repayment fee

Household accepts loan

Borrower duly repays loan

Possible situations to address
Wants to repay loan early
Wants more credit
Wants to consolidate loans

Borrower repays loan, but with increasing difficulty
Borrower informs lender, requests change in repayment schedule
Tries to find additional income
Tries to reduce expenses
Sells assets to stabilise personal budget

Borrower defaults

Borrower's budget stabilised, repayment problems solved

Borrower defaults and is in (impending) insolvency

Lender withdraws from agreement due to non-compliance with terms and conditions or failure to repay entire loan

Potential assignment (sale) of debt

Meets discharge conditions
At least 30% of unsecured debts expected to be repaid within 5 years

Legal enforcement/judicial proceedings, court ruling/commencement of execution

Yes

Discharge

5-year repayment schedule or sale of assets

Repayment schedule agreed

No

No

Debtor faces execution or enforcement of ruling

Collateral

Debtor complies with discharge conditions

Yes

No

Repayment schedule agreed

Yes

No

Creditor sells collateral

No

Yes

Yes

No

Payment

Collateral value equals or exceeds amount owed

Bankruptcy

Enforcement of ruling, execution of property

No

Property sufficient to discharge debt

No

Yes

Yes

Yes

Debtor has no debt to creditor

Debt persists

Debtor has no debt to creditor

The flow chart shows that borrowers can avoid many problems by properly selecting the lender and familiarising themselves with the details of the credit agreement. If a household runs into repayment problems, it is vital for it to communicate with its creditors and find a common solution. Acting early can significantly alleviate the negative impacts on the debtor's future situation. It is clear that "starting from scratch" is possible in only some cases. In other situations the debt persists and in many cases represents a lifelong burden for the household.